INTERACTIVE VIDEO PRIMER
Nursing Education

Edited by

Scott Alan Stewart
Editor/Publisher, *Interactive Healthcare Newsletter*

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Chapter 1

Videodisc Hardware Systems

Interactive videodisc systems come in a variety of configurations, depending on the use for which they are intended. They can range in complexity from a single videodisc player and keypad to a fully integrated system of computer, graphic overlay board, touchscreen monitor, and videodisc player—such as the IBM InfoWindow. Even these high-end systems can be further enhanced by adding peripherals including a CD-ROM drive, digitizing boards, and more. To better understand the different configurations, it is useful to classify them according to the levels of interactivity defined by the Nebraska Videodisc Design/Production Group in 1980:

Level I systems are simply stand-alone videodisc players which can be controlled using either a remote control or, in the case of some Pioneer players, a barcode reader. The interactivity is limited to what the viewer can produce using the videodisc player controls only—forward, reverse, slow-motion, still/freeze frame, picture stop, chapter stop, frame address, and dual-channel audio features. There is no computer processing involved.

Level II systems are simply videodisc players equipped with an internal microprocessor which can execute programming instructions that have been encoded onto the videodisc. Level II provides programming features such as branching at multiple choice questions, menu selections, and even record-keeping.

Sony and Pioneer both sell Level II videodisc players, but each company has its own programming language which must be encoded onto the videodisc. Therefore, Level II videodiscs coded for Pioneer players will not play on Sony Level II videodisc players, and vice versa. One solution to this problem is to encode programming for both Sony and Pioneer onto the same videodisc.

Level II videodisc players cost approximately twice as much as Level I videodisc players, and developing Level II discs requires additional time and expense to design and code the programming that is to be pressed onto the videodisc. Although wonderful programs can be developed for Level II systems, there is very little on the market in the way of materials for health sciences education. This may change in the future if lower-cost Level II players are developed for the educational market.

Level III systems consist of videodisc players connected to external computers—usually through a parallel port via an RS-232C cable. Computers commonly used in Level III systems are IBM PC (and compatibles) and Apple Macintosh computers. Level III systems, as with level II systems, provide programmed instruction. However, because the ca-

pabilities of the external computer are greater than the processors in Level II players, Level III programs can be more sophisticated.

The first Level III systems had two monitors: one for the computer output and one for the videodisc image. These are known simply as two-screen systems. More recently, one-screen systems have become popular—those which display both the computer text and the videodisc image on a single screen. This is done using a graphics overlay board which combines the two otherwise incompatible signals. Both two-screen and one-screen systems are popular in health sciences settings, depending on the needs of the discipline and the content of the software.

Level IV and above has been proposed by some people to describe the addition of peripherals such as CD-ROM drives, digital video and audio, etc. However, the industry has not settled on any single standard for these higher levels which, technically, all fall into the Level III category.

Two-Screen Videodisc Systems

Generally, two-screen videodisc systems are driven by either an IBM-PC compatible computer or an Apple Macintosh computer. With two-screen systems, the computer text/graphics appear on one screen, while the videodisc image appears on a separate monitor. These systems are most common in medical fields where there are a large number of still images—such as radiology, pathology, or hematology. In this way, an image can be up on one monitor while text or graphics explaining the image can appear simultaneously on the other monitor.

Where applications involve simulation or sophisticated tutorials, one-screen systems are more common. While medical applications are generally split between two-screen and one-screen systems, nursing applications for two-screen systems are rare. The few nursing programs that were designed for two-screen PC systems were developed before the increased availability of one-screen systems. Today, because the majority of videodisc systems in place for nursing education are one-screen systems, even the few commercial software programs designed for two-screen systems have been converted to play on one-screen systems. Therefore, while medical educators will find a use for both one-screen and two-screen systems, few nursing educators would consider purchasing two-screen videodisc systems unless they planned to develop their own courseware and had no plans to distribute the programs to other educators.

One-Screen PC Systems

For many interactive video applications, it is desirable to combine the text and graphics of the computer with the video image from the videodisc player. Doing so not only reduces the number of monitors needed, but also allows for any number of special effects—such as placing computer generated graphics or text on top of a video image. However, since the computer output and video output are not compatible with each other, graphic overlay boards were developed to achieve the mix.

For many years, the dozens of graphic overlay boards on the market were incompatible with one another. This meant that in order to play a program developed by someone else, you had to purchase the specific graphic overlay board which they used when devel-

oping the program. Clearly, this presented a problem for anyone who wanted to play programs developed by several different sources.

Finally, in 1987, IBM introduced the InfoWindow system, a combination of computer, overlay board, videodisc controller, touchscreen monitor, and videodisc player designed specifically to deliver interactive video programs. As an increasing amount of videodisc courseware was developed to run on the InfoWindow system, other hardware manufacturers began emulating the IBM systems so that "InfoWindow compatibility" became a selling point for their systems. Today, the InfoWindow is the standard for which almost all software manufacturers program.

By mid 1991, there were at least seven hardware delivery systems which can play courseware designed for the InfoWindow: IBM InfoWindow, IBM M-Motion Video systems, Sony VIEW System, FITNE System, Visage System, Video Associates Labs System, Microvitec System, and the Matrox Interactive Video System. These systems list between $5,000 and $11,000, depending on the manufacturer and the options purchased.

One-Screen Macintosh Systems

Although there are a number of graphic overlay cards available for the Macintosh, none of the cards is compatible with another. Therefore, Macintosh users are suffering from the same problems PC users had to live with until the standardization around the InfoWindow. Although one-screen applications are being developed for in-house use at some medical schools, until standardization is achieved, Macintosh-based interactive video courseware intended for distribution will be designed for two-screen systems.

Dedicated/Proprietary One-screen Systems

In an attempt to provide all of the benefits of Level III interactive video without the high cost of the hardware systems, some commercial vendors have assembled proprietary videodisc systems which they can offer clients for as little as $1,500. These systems usually consist of a proprietary computer, videodisc player, overlay card, and some form of input, often a customized keypad.

The advantage of this type of system is the low cost. The disadvantage lies in the fact that the system will play only courseware provided by the single vendor, and will not play any of the programs which can be bought "off the shelf."

In some specialized markets this is not a problem because the user is buying a dedicated training package. An example of this is the ProCare training curriculum developed by Interactive Health Network (IHN) in Atlanta, Georgia. This curriculum consists of 34 different videodisc modules designed to train nurse assistants in nursing homes to successfully take a written competency evaluation required for certification. In this highly selective and focused market, the inexpensive, proprietary delivery system offered by IHN is a reasonable alternative to the more standard, and much more expensive, InfoWindow-compatible systems.

Features to Consider When Selecting a One-screen System

One-screen, InfoWindow-compatible hardware systems consist of several components: computer, graphics overlay board, touchscreen monitor, videodisc player, and InfoWindow emulation software.

Computer

The most common features found in computers which drive interactive video systems are 640K to 1MB RAM in an AT-compatible machine (286/386/386SX) running at 12 to 20 MHz and containing either a 5.25-inch or a 3.5-inch (or both) floppy disk drive and a minimum 40 MB hard drive. As there is little difference in cost to purchase a higher-end computer, buyers may want to consider a 386 machine with at least 1MB RAM and an 80 MB or greater harddrive.

Graphics/Overlay Board

In order to combine the computer text and graphics with the image from the videodisc player, a special graphics overlay/videodisc controller board must be installed in the computer. Although these boards may provide EGA or VGA computer graphics, all provide only EGA graphics when playing InfoWindow-compatible courseware. This is because the IBM InfoWindow system itself has an EGA graphics capability, resulting in all InfoWindow software being written for that level. VGA graphics boards, when not emulating the InfoWindow system, will display full VGA graphics for all other computer applications. While VGA boards are unquestionably better suited to the graphic standard of the future, they can increase the cost of an interactive video system by $1,000 or more over their EGA counterparts.

Touchscreen Monitor

Level III videodisc interaction requires input to the computer from the user. This input may be entered through several different devices: computer keyboard, touch screen, light pen, mouse, or other devices. By far, the computer keyboard and touchscreen monitors are the most popular methods of user interface, or input devices, but look for the mouse to gain ground in the next two years. The touchscreen is considered the most "user friendly" form of input in that it requires no typing skills and allows the user to keep his or her eyes on the program at all times. However, the touchscreen is not particularly accurate, and in extended learning situations, the touch screen can become tiresome. The mouse makes up for these deficiencies with pinpoint accuracy and a low fatigue level. In the future, when all videodisc programs are designed to be used with a mouse, consumers can save approximately $1,200 on hardware systems by using only a mouse and not spending the extra money that a touchscreen costs.

Today, however, virtually all programs are designed to run with a touchscreen. Buyers should be aware that there are several different types of touchscreens, each with a different look and feel. Some consist of a film over the monitor which can interfere with the picture brightness and clarity. The best type of touchscreen will have nothing but clear glass between the user and the video image.

Videodisc Player

There is a wide variety of videodisc players available, from consumer models to educational and industrial models. Most educational and industrial models have an RS-232C interface which allows the player to be connected to an external computer. Some models are Level II players with a small microprocessor built in which allows for a limited amount of programming to be loaded from the videodisc.

The most popular videodisc players are from Pioneer and Sony. The least expensive models used with interactive videodisc systems are the Pioneer LD-V2200, LD-V4200, and the Sony LDP-1450. These players include an RS-232C interface, have an access time (longest time it takes to go from one frame to another) of two to four seconds, and list between $895 and $1,095.

When additional features or Level II capability are needed, the most popular players are the Pioneer LD-V8000 and the Sony LDP-1550. These players improve access time to less than two seconds and include multi-track jumps which allow instant frame jumps within a 100-200 frame area. This class of videodisc player sells for between $1,598 and $2,280. For most interactive video systems, however, the Pioneer LD-V4200 and the Sony LDP-1450 are the most popular, providing reasonable access time for a modest price.

InfoWindow Emulation Software

Although each graphic overlay/controller board on the market is incompatible with the others, vendors have developed software programs which can translate InfoWindow-compatible software so that they can be executed by their graphics board. For the most part, these InfoWindow emulation programs work well. Occasionally, these emulators fail when a developer has programmed an obscure command into his courseware. In most of these instances, the software developer and the graphic board vendor put their heads together and quickly resolve the problem.

Vendor Support

Anyone considering the purchase of an interactive video system also should be concerned with the support that will be provided after the sale. Vendors should be expected to provide, at the very least, telephone support to assist in the initial setup and operation of the system. Ongoing telephone support and quick replacement of failed components also should be provided. Although interactive video systems generally have a low failure rate, conscientious vendors will attempt to relieve any anxiety purchasers may have.

Available InfoWindow-Compatible Hardware Systems

IBM InfoWindow System

The original IBM InfoWindow System differs from all the other systems in that the graphic overlay and controller board is located in the touchscreen monitor instead of in the computer. The InfoWindow monitor can be connected to any IBM-compatible computer (PC/XT/AT/PS/2) with the addition of special EGA graphics and jumper cards. The InfoWindow monitor lists for $4,195. With additional cables, software, and videodisc player, the total system lists for approximately $11,000. Discounts up to 40 percent are available to educational institutions.

One early disadvantage of the InfoWindow system was the fact that most sales representatives packaged it with the most recent IBM computer. In January 1990, this includes the PS/2 Model 30-286 or the PS/2 Model 50z. Problems can arise because many software firms could not keep up with the rapid changes IBM was making in their computers. This resulted in occasional software problems for schools with PS/2 computers which attempted to run videodisc and computer-assisted instruction programs designed for earlier model computers. Schools with InfoWindow systems built around the original AT or compatible computers rarely experienced these problems.

Although the InfoWindow produced the highest-quality video image of all systems on the market, IBM has stopped making them in favor of the new M-Motion Video Adapter. When the current supply of InfoWindows is exhausted, they no longer will be available for sale. The effect this will have on continued InfoWindow support is unknown.

Sony VIEW System

In May 1989, Sony Corporation introduced the VIEW-5000 videodisc system. The VIEW System was the first truly integrated videodisc system because Sony has built the computer *and* LDP-1200 videodisc player into the same unit, reducing both the space and number of cable connections needed.

Outside of the compact design, the most notable features of the VIEW 5000 was its IBM InfoWindow emulation and its lower price. Though the basic unit lists for only $4,995, the addition of a touchscreen monitor ($1,875) and 40MB hard disk ($975) will run the list price of the system closer to $8,000—still several thousand less than the IBM InfoWindow list price.

In addition to InfoWindow emulation, the VIEW 5000 provides VGA graphics compatibility and a 286 compatible computer running at 8MHz or 10MHz with 640K main memory, 256K standard graphics memory, and a 3.5-inch floppy disk drive.

One possible disadvantage of the Sony VIEW may be the 40MB hard disk drive. With the increasing size of educational programs (eight to 10MB is not unusual), a 40MB drive may fill up fast. Due to the compact design, standard hard disk drives will not fit in the VIEW, although Sony soon is expected to offer 80 MB and 100 MB hard drives for the VIEW. Although the VIEW 5000 costs $1,500 more than the lowest priced InfoWindow-compatible hardware system, many people feel the compact design and the Sony name are enough to warrant the difference.

FITNE System

Designed by the Fuld Institute for Technology in Nursing Education (FITNE), the FITNE IBC202 system is built around an AT compatible, 8/12 MHZ 286 computer with one MB RAM, 5.25-inch floppy drive, and 80 MB hard disk drive. A VAL Microkey/Mark 10 EGA graphics overlay board providing 16 colors is installed and drives a Mitsubishi 14-inch color monitor with an Elographics Intellitouch Screen and a Pioneer LDV-4200 player.

Emulation software produced by Video Associates Labs (VAL) allows the FITNE system to run software programs written for the IBM InfoWindow. The big advantage of the FITNE system is the support, which includes a one-year warrantee and the promise to provided replacement systems while the original is being repaired. The system lists for $7,349 and sells to FITNE members for $6,195.

Visage System

In October 1989, Visage, Inc. announced the availability of yet another IBM InfoWindow-compatible system. The system consists of an AT-compatible Everex 286 12 MHz computer with one MB RAM, 40MB hard drive, and 5.25 floppy disk drive. Along with a Sony LDP-1200 videodisc player, a touchscreen monitor, and the Visage controller and overlay board, the Visage system also comes with a one-year warrantee and lists for more than $7,000, but has been on perpetual sale at $5,495, making it the lowest-priced system on the market. As with the Sony and FITNE systems, emulation software permits the Visage system to run videodisc software designed for the IBM InfoWindow.

VAL Multimedia Workstation

In early 1990, Video Associates Labs announced their own interactive video system built around their MicroKey/Mark 10 graphic overlay board—the same board used by FITNE. The ValWIN system is built around an AT-compatible 10 MHz computer with a 3.5-inch floppy and 40 MB hard drive. The system also comes with a Pioneer LD-V4200 videodisc player, a Microvitec 704/FST touchscreen monitor, InfoWindow emulation software, and a one year maintenance agreement. The ValWIN Multimedia Workstation rates as the lowest-priced InfoWindow-compatible system with a list price of only $5,895.

Matrox Interactive Video System

The Matrox Interactive Video System (IVS) was originally developed in 1987 in response to a contract bid offered by the US Army for nearly 2,000 interactive videodisc systems. In the summer of 1990, Matrox announced that it had developed InfoWindow emulation software for its system, thereby bringing the IVS into the mainstream market.

Matrox has stacked the videodisc player on top of the computer to form a single, integrated unit—similar though more bulky than the Sony VIEW system. A basic configuration consists of an AT-compatible 10 Mhz computer with 3.5-inch floppy, 40 MB hard disk, and touchscreen monitor, and lists for $9,140. An external 5.25-inch floppy drive cost an additional $695. The disadvantage of this system is immediately apparent. In lieu of discounts, the Matrox IVS is one of the more expensive InfoWindow-compatible hardware systems available.

Digital Video Graphic Boards

The newest generation of graphic boards has the ability to digitize video as it comes off a videodisc and display it on a VGA monitor. Digitizing an image allows it to be manipulated in ways not possible with standard video displays. For example, using digital technology, a full video image can be placed in a window of any size and shown anywhere on the monitor. In fact, several full video images can be shown in several windows at the same time on one monitor. Digital technology also can produce fades, dissolves, and other special effects not possible with standard video.

Because the capability of digital video adapters surpasses those of the InfoWindow-compatible hardware systems, eventually a new standard will evolve which will incorporate these new features. However, since this is a new technology, and it will take some time before courseware is written to take advantage of digital effects, manufacturers of the digital boards also are beginning to offer InfoWindow emulation. This means that, while

running InfoWindow courseware, hardware systems equipped with digital video adapters will be emulating standard EGA graphics boards. The rest of the time they can be used to the full extent of their digital capabilities.

Although there are several digital video adapters on the market, at this time only three are capable of playing InfoWindow courseware, with one of these—Microvitec's DAVID board—packaged in a complete interactive video system. The other two boards are VideoLogic's Digital Video Adapter and IBM's M-Motion Video Adapter.

Microvitec DAVID

Microvitec, international marketers of color and touchscreen monitors, has developed the DAVID (Digital Audio and Video Interactive Device) Digital Overlay Board. DAVID occupies a single slot in an IBM PC/XT/AT or compatible and will support any industry standard VGA or Super VGA graphics adapter.

Microvitec has packaged DAVID into a new, integrated, InfoWindow-compatible hardware system. The system is built around a 16MHz AT-compatible with one MB of RAM, a 3.5-inch floppy disk drive, a 40MB hard drive, headphone jack, and built-in stereo speakers. A Pioneer LD-V4200 is neatly stacked with the computer to form a unit nearly as compact and cable-free as the Sony VIEW. The Insight Interactive Video Workstation is slated to be available soon and is expected to list for approximately $9,500. The DAVID board alone is currently available and lists for $2,295.

VideoLogic Digital Video Adapter

VideoLogic recently introduced two Digital Video Adapters, the DVA-4000/ISA for use with Industry Standard Architecture (PC/XT/AT compatibles) and the DVA-4000/MCA for use with IBM's range of PS/2 computers using Micro Channel Architecture. Both boards provide real-time manipulation of every aspect of moving video images and output a high-resolution VGA image.

The boards sell for $2,250, and can be coupled with a computer, videodisc player, and touchscreen monitor by do-it-yourselfers to build an InfoWindow-compatible hardware system. The DVA-4000 InfoWindow emulation software costs an additional $150.

IBM M-Motion Video Adapter

The IBM M-Motion Video Adapter/A is a special adapter card that digitizes video and delivers it in real-time on a VGA monitor. Designed for use in a Micro Channel Architecture bus, the M-Motion card can be used only in IBM's PS/2 50, 55SX, 60, 70, or 80 Micro Channel computers, and can not be installed in PC, XT, or AT compatibles.

Recent trials have shown that computers fitted with the M-Motion Video Adapter are able to play InfoWindow courseware which has been developed using commercial authoring packages, such as *InfoWindow Presentation System (IWPS)*, *Quest*, or *TenCore*. In these cases, the M-Motion board translated all of the touchscreen commands into mouse commands so an expensive touchscreen monitor is not needed. However, InfoWindow courseware which has been written using other C or other programming languages may not be compatible with the M-Motion adapter without minor programming changes.

The M-Motion board lists around $2,200, making a complete system (without touchscreen monitor) cost around $5,000. Unfortunately, the video quality achieved when

digitizing an image of the videodisc player is poor when compared to other systems, and may not be adequate for certain high-resolution applications. Because of the limitations placed on users regarding the type of computer used and the quality of video delivered, the M-Motion Video Adapter is not the hardware solution for everyone.

Summary

No one system will meet all needs, and buyers must choose their system based on factors such as cost, expandability, support, and image quality. However, a few generalizations may be made regarding the selection and purchase of interactive video hardware systems. If cost is the bottom line, the Visage system is the lowest-priced at $5,495 and comes with excellent support. Those in nursing settings also will want to consider the FITNE system for their outstanding support and special focus to the nursing community.

Those who would like a VGA graphics in what is by far the most compact and least complex system available should look closely at the Sony VIEW 5000. Although the M-Motion Video Adapter provides a look at the future with it's low price, digitizing capability and mouse-driven feature, it is still an evolving technology and is, at best, unproven. Still, it may be the best purchase for those who's institutions are locked into purchasing computers from Big Blue.

Hardware Contacts

Fuld Institute for Technology in Nursing Education (FITNE), 28 Station Street, Athens, OH 45701; 614/592-2511.

Matrox, 1055 St. Regis Boulevard, Dorval, Quebec, H9P 2T4 Canada; 514/685-2630.

Microvitec, 1943 Providence Court, College Park, GA 30337; 404/991-2246.

Pioneer Communications of America, 600 East Crescent Avenue, Upper Saddle River, NJ 07458; 201/327-6400.

Sony Corporation of America, Intelligent Systems Group, Sony Drive, Park Ridge, NJ 07656; 201/930-6034.

Video Associates Labs (VAL), 4926 Spicewood Springs Road, Austin, TX 78759; 512/346-9407.

VideoLogic, 245 First Street, Cambridge, MA 02142; 617/494-0530.

Visage, 1881 Worcester Road, Framingham, MA 01701; 508/620-7100.

Chapter 2

Nursing Education

The nursing education market was discussed by Chistine Bolwell, RN, MSN, at the Interactive Healthcare 89 conference, held June 3-6, 1989 in Washington, DC. The following is an edited transcript from that presentation.

Nursing Education: Complex Market with Tremendous Potential,

Christine Bolwell, RN, MSN, Editor/Publisher, Nursing Educators Microworld.

Nurse educators and videodisc developers want to see interactive video become a significant part of nursing education. Both groups must work together to convince hospital administrators and school of nursing administrators that interactive video is a solution to many of their problems. Ultimately, the best way to do this is to demonstrate that interactive video is a cost-effective means of dealing with these problems.

Economic Pressures on Hospitals

The Nursing Shortage. The nursing shortage is widespread and is having a significant impact on hospital budgets. Surveys by the American Hospital Association and others indicate that in 1988, 78 percent of the nation's hospitals reported a shortage of nurses.

Bed Closures. Fewer nurses are available to care for patients, forcing some hospitals to close their emergency rooms and hospital beds. Closure of one hospital bed can result in as much as $350,000 per year in lost revenues.

Agency RNs. To keep hospital beds open, hospitals are hiring nurses from temporary agencies. The salary for these temporary nurses is twice that of a hospital employed RN.

RN Recruitment. Hospitals are forced to recruit heavily for nurses. According to the 1988 National Association for Health Care Recruitment, 1988 recruitment budgets averaged $154,000 per hospital—up 35 percent from 1987.

RN Salaries. To attract the best and the brightest nurses, hospitals are increasing nursing salaries. Salary wars in southern California have increased base salaries to between $30,000 and $50,000. With a 20 percent night shift differential, some hospitals are paying night nurses as much as $60,000 a year.

Cost of Replacement. With RNs constantly being attracted to hospitals with more satisfying work environments, the job turnover rate is between 13 percent and 20 percent per year. Adding together the costs of recruitment, paying temporary nurses, and orientating newly hired nurses, it can cost a hospital $15,000 to $20,000 to replace just one RN.

RN Orientation. In many cases, newly hired experienced nurses collect a salary while sitting through an orientation that is only partially relevant to them. Hospital administrators would like to find a way to reduce the cost of orientation programs, which can be as high as $96,000 per year.

Solutions to Problems Faced by Hospital Administrators

Hospital administrators confronted with these expenditures are looking to increase staff nurse retention and productivity, increase the return on dollars spent for mandatory education, and decrease costly litigation due to to on-the-job errors by under trained nurses. The steps many administrators can take are:

Accelerate Orientation. Many hospitals have turned to a competency-based, individualized orientation. The knowledge and skill deficits of each new RN employee are identified and corrected. The program is customized at different levels for experienced RNs, RNs employed to work in a new specialty area, and for recent nursing school graduates.

Cross-Training. Productivity is increased with cross-training, which allows RNs to function safely in more than one area of the hospital. Cross-training also reduces costly mistakes and the possibility of legal action.

Management Skills. Hospitals with the lowest staff turnover are ones which provide a supportive environment, professional growth, and professional recognition. Nurse managers can help create this constructive work environment by applying human resource management skills. Unfortunately, few nurse managers have been formally trained in this area.

Business Skills. Due to recent economic pressures, hospitals increasingly are being managed as a business. Nurses also need to learn essential business skills to manage nursing units efficiently.

Nursing Skills and Competency. Nurses are always in need of updates on new drugs, new equipment, and new procedures. An increasing number of educational programs are mandated by state, federal, and professional organizations.

Reducing Litigation. The threat of litigation is a big economic incentive to providing nurse education that will result in increased patient safety. Two common problem areas are medication errors and patient falls.

Searching for a Training Solution

While all hospital administrators recognize the need for educational programs, the big problem is implementation. When a hospital is short-staffed, it is difficult to schedule time for groups of nurses to listen to educational presentations. In addition, when nurses are being paid $25 to $30 an hour, it becomes very costly to place them in lengthy training sessions.

Hospital administrators are looking for educational programs that will reduce the time for learning, obviate the need for removing groups of nurses from a patient unit, promote learning among nurses, and—most important of all—assure learning.

Economic Pressures on Schools of Nursing

Reduced Enrollment. Enrollments in schools of nursing peaked in 1983 and have been on the decline ever since. As enrollments decline, so does the available dollars with which to operate the school. In order to deal with the economic pressures placed upon nursing schools, administrators are forced to find ways to attract larger numbers of qualified students.

Student Recruitment. To increase enrollments, administrators are taking a close look at the populations from which students can be recruited. Because it is a buyer's market, potential students can be selective in choosing a school of nursing.

The best and brightest high school students and second-career students will be attracted to a school with graduates who consistently pass the licensure examination. The thousands of RNs returning to school for a baccalaureate degree will be looking for schools which offer accelerated learning of essentials, a curriculum that is relevant to individual needs, and academic credit for previously acquired nursing knowledge and experience.

Cutting Costs. In addition to stepped-up recruitment efforts, school administrators must find more cost-effective means to accomplish their basic mission—preparing students to pass the RN licensure exam (NCLEX) in preparation to practice nursing.

Maximizing Faculty Expertise. Rather than having faculty spend all their time dispensing basic knowledge, administrators must allow them to teach the more complex skills so important to nursing practice today—decision-making, critical thinking, problem-solving, and retrieving, collecting, analyzing and communicating information.

In view of the economic pressures on schools of nursing, administrators are eager to design a curriculum that will reduce redundancy, increase relevancy, speed the learning of essentials, and maximizes the expertise of their faculty.

Therefore, the driving forces for both hospitals and schools of nursing administrators are solutions that will attract and retain staff nurses and students, accelerate the learning of essentials, and enhance productivity by maximizing human resources.

Attributes of Interactive Video

Reduced Learning Time. Extensive research shows that computerized educational materials result in the same degree of learning as traditional methods, but in one-third to one half the time.

Flexible Access Time. Unlike traditional methods of classroom instruction, computerized education and training programs can be accessed at any time. This is an important attribute for a profession that requires round-the-clock employment. Flexibility in access time is also important for the part-time student. Of the nearly 50,000 RNs enrolled in baccalaureate programs, 70 percent are part-time students.

Flexible Presentation. Unlike traditional methods in which all learners are given the same information, computerized learning materials can be individualized to meet the specific needs of each learner and thus reducing redundancy.

Cost-effective. Many vendors and educators have compared the cost of traditional learning methods with the use of computerized programs and demonstrated substantial fiscal savings with interactive video.

Appeals to Adult Learners. The majority of those who need education and training in nursing today are adult learners. The average age of the two million RNs in clinical practice is 41.5 years old. The average age of the ADN student is 30 years old. The average age of the returning RN student is 31. ADN students and the RN students represent 70% of the nearly 200,000 students enrolled in nursing schools.

Incorporation of Video and Audio. Health care depends greatly upon sight and sound. Nursing students need opportunities to see and hear conditions which can not be represented in textbooks or on computer screens. Interactive video can help students to make clinical assessments, to generate appropriate nursing diagnoses, and to make clinical decisions by allowing them to see and evaluate a patient's color, observe breathing patterns, and hear breath and heart sounds.

Barriers to Implementation

Administrators are not racing out to buy and implement interactive video technology. Although many observers may feel that one barrier to widespread acceptance is cost, in schools of nursing, research has shown the biggest reasons given for the lack of technology is not cost, but a lack of faculty time and skill.

Although the biggest reason given by hospital educators was cost, in that same survey 94 percent of the respondents also reported purchasing videotapes regularly. Videotape also can be an expensive medium, but is widely used because there are hundreds of titles that serve the needs of hospital educators.

Which points out another frequently cited barrier to use of microcomputers in schools and hospitals. The lack of good software, and not the cost of the technology, is the most likely explanation for schools and hospitals not owning and using microcomputer and interactive video technology.

Microcomputer Acquisition

Despite complaints about cost, 71 percent of the schools of nursing and 41 percent of hospital education departments own microcomputers. The growth of computer hardware is clearly related to an increase in available software. The number of nursing software listings for microcomputers increased from 150 in 1985 to nearly 400 in 1989. If the growth in software and in hardware acquisition continues at its present rate, every school of nursing and just about every hospital education department will own and use microcomputers by 1997.

Interactive Video Acquisition

Regarding interactive video, seven percent of the schools of nursing and less than one percent of the hospitals own interactive video hardware. In addition, only 42 interactive videodisc programs even somewhat appropriate for nursing education are available for purchase. This reflects a hardware and software penetration which is comparable to microcomputer penetration in 1983.

However, when you compare the tremendous needs of nursing education for interactive video technology with the benefits that it offers, it is easy to believe that its growth will at least match the ten percent growth rate of microcomputer acquisition. At that rate, almost all schools of nursing will own interactive video hardware by 1999. In the same year, just over half of the hospital education departments will own interactive video hardware.

Forces Expediting Acquisition

At least five forces are expediting the acquisition of interactive video hardware:

Reduced Technophobia. Because the microcomputer has paved the way, nursing educators, administrators, and students are experiencing a lesser degree of technophobia regarding interactive video technology.

Hardware Placement. It is becoming easier to get hardware into hospitals. A number of groups are either donating interactive video equipment or making it available on loan or at a reduced price.

Establishment of FITNE. The Fuld Institute for Technology in Nursing Education (FITNE) has been single-handedly responsible for installing interactive hardware in 75 schools of nursing (five percent of all schools) in just one year.

Computerized NCLEX-RN. Many schools of nursing will be compelled to integrate interactive video technology because of the development of a computerized examination by the National Council of State Boards of Nursing. Administrators will want to insure that their students are comfortable learning and testing on computerized systems.

Magnetic Pull. The year 2000 itself may accelerate these trends. According to futurist John Naisbitt, there is a psychological fascination with the end of an old and the beginning of a new century. The pull toward the end and beginning of a new millennium is even stronger. Thus, during the next 10 years the pull toward interactive videodisc integration may be irresistible.

The most important forces expediting the integration of interactive video technology are commercial developers—who must work with educators to provide solutions to problems faced by hospital and nursing school administrators—and educators—who must work with commercial developers to convince administrators that videodisc technology is a solution to many of the economic and educational problems they face. By working together, the widespread use of interactive videodisc technology will become a reality before the turn of the century and the new millennium.

Chapter 3

Universities/Colleges

Universities and Colleges have been drawn to the incredible potential of the videodisc as a teaching tool and image storage medium. So far, these institutions have played an important role in the research and development of interactive videodisc programs. Undermanned and underfunded, health sciences schools have, over the years, developed the prototypes which serve as the inspiration for many of the commercial products now being developed. Now the school environment is beginning to produce enough videodisc courseware of their own to make up about half of the health-related videodisc courseware available for purchase.

Early Videodisc Efforts

Looking at the early years of health-related videodisc development, two universities stand out as pioneers in the field: the University of Iowa and the University of Washington. The University of Iowa, through the Weeg Computing Center, produced two programs in 1982, both using the now discontinued Thomson-CSF transmissive videodisc player. *Urology Retrieval* was a pilot project to demonstrate the advantages in ease, speed, and accuracy of retrieval of visual of images from videodisc. *Gynecology Patient Education* was the first patient education videodisc ever developed and contains information on radiation therapy for cervical cancer. Although neither of these discs is available today, the University of Iowa has produced several other programs for distribution, including *Assessment of Neuromotor Dysfunction* and *Lamaze: The Nurse's Role*.

The University of Washington, through the Health Sciences Learning Resource Center, produced several videodiscs in 1982, many of them for the Miles Learning Center (see Chapter 2, *Pharmaceutical Companies*). The most popular of the early discs was the *Medical Applications Videodisc: Hematology*, also known as the Hematology Disc. This disc contains more than 6000 slides and several films, and was responsible for the term "generic videodisc." Generic videodiscs are those that contain slide collections, sometimes film footage, and are programed for instruction by the institution that purchases it. Other early videodiscs produced at the University of Washington include *Trauma Training Materials*, *Clinical Microscopy*, and *Acute Leukemia Morphology*. In recent years, the University of Washington has produced seven other generic videodiscs, all of which are available for purchase.

Distributing School-produced Programs

As more and more educational institutions are becoming involved in the development of generic videodiscs and interactive videodisc programs, they are looking at ways to make their courseware available to other schools and at the same time recover some of the development costs of these programs. They are finding, however, that they lack the experience, and often the administrative flexibility, to do so easily.

Co-ventures With Medical Publishers

At the same time, commercial companies are looking to "pick up" existing programs to distribute, thereby saving the significant expense of developing their own programs. Schools with reasonably good, marketable programs can expect to be approached by a half-dozen commercial firms who would like to market their programs for them. Such an arrangement was established early between the University of Iowa and medical publishers Williams and Wilkins in Baltimore, Maryland. After having produced *Assessment of Neuromotor Dysfunction in Infants* in 1984, the University of Iowa agreed to allow Williams and Wilkins to market the program. Another cooperative venture was *Sight Through Sound: An Interactive Introduction to Medical Diagnostic Ultrasound* produced in 1984 by another medical publisher, W.B. Saunders Company. Although the entire project was funded by Saunders, the disc was produced in cooperation with the Thomas Jefferson University Hospital, with all scenes being shot on location there.

These publishing firms found, however, that there is a multitude of problems associated with marketing videodisc courseware. Not the least of these is the lack of an established hardware base. Instead of purchasing just a $1,000 videodisc program, many buyers find they are forced to spend an additional $6,000 to $10,000 on a hardware system to play the program. Another problem until recently was the lack of hardware standards. Even if a school found the money to purchase the necessary hardware configuration, there were no assurances that other commercial videodisc programs would be able to play on that same system. A third problem with selling videodisc courseware developed by health sciences schools is the limited market. Most of these programs cover specific topics which limit their usefulness to a potential market of hundreds, rather than thousands. This, combined with the less-than-commercial-quality production value of most programs, makes it difficult to sell enough programs to justify the cost of development,replication, packaging, marketing, and distribution.

Changing Market Conditions. In the past year, there has been an increased level of interest in interactive video among health sciences schools—a primary market for publishers. This fact, combined with a move toward hardware standardization, has led medical publishers to reassess the market.

Williams and Wilkins, looking to expand their computer-based electronic publishing offerings, had a one-year option on the rights to the *ElectricCadaver*, a *HyperCard* textbook of anatomical images and graphics developed at the Stanford University School of Medicine. However, they recently let this option expire.

Meanwhile, the University of Colorado Health Sciences has developed a three-dimensional atlas of the human knee with developmental funds provided by St. Louis-based publisher C.V. Mosby & Co. As of January 1990, Mosby has not made a decision whether to

market the disc alone, or to support the development of additional atlases covering other areas of human anatomy.

Other Commercial Co-ventures

Some commercial vendors who have developed their own courseware for the healthcare market find it is easier to market a large library of programs rather than a few programs. For this reason, many vendors are always looking to pick up and polish school-produced programs that they can add to their offerings.

Applied Interactive Technologies. One effort at a school/commercial co-venture involves a low-cost, proprietary, hardware delivery system. Applied Interactive Technologies (AIT) in Jackson, Mississippi put together a Level III hardware system that sells for only $1500. Since this system is proprietary and not compatible with other integrated systems such as the IBM InfoWindow or the Sony View system, the AIT system can not play videodisc programs developed by anyone but AIT. Therefore, in order to sell the system, AIT put together a library of videodisc programs by contacting schools and commercial firms that already developed programs and received permission to convert these programs to the AIT system and market them.

The advantage of this arrangement is the low cost of the delivery system. The problem is that schools and hospitals who buy this system are limited to one developer for their supply of courseware. They would not be able to use any programs developed by other commercial firms and by other health sciences schools. This hardware/software package was introduced in February 1988 and has not been very successful.

ALIVE. Another firm that began picking up courseware developed by schools is the ALIVE Center, developers of the *Active Knee* series of videodisc programs. In order to broaden their courseware selection, they secured rights to *A Right to Die*, a videodisc program produced by Carnegie Mellon University. They also are marketing a two-disc interactive videodisc program *Preventative Cardiology*, produced in conjunction with the Case Western Reserve University's School of Medicine.

Edudisc. Edudisc, Inc., of Nashville, Tennessee develops and distributes interactive video products using the Macintosh computer. To add to their offerings, they picked up several programs developed by Bloomsburg University. The programs are Introduction to *Case Studies in Hematology, Child Sexual Abuse, Stress Management,* and *AIDS Education.*

Health Sciences Consortium. The Health Sciences Consortium is a non-profit cooperative created in 1971 to distribute health sciences instructional material. Recently, the HSC has been distributing several videodisc programs developed by schools who are members of the IBM-sponsored Healthcare Interactive Videodisc Consortium.

FITNE. The Fuld Institute for Technology in Nursing Education was organized by the Helene Fuld Health Trust to promote the use of technology in nursing education. One of the activities of FITNE is the development and distribution of interactive video courseware for schools of nursing. The first program developed by FITNE was originally produced at Hocking Technical College. FITNE is reviewing additional school-produced programs for additional development and distribution.

Stewart Publishing. Stewart Publishing, Inc., sponsor of the Interactive Healthcare Consortium, helps schools market their own material, or will market and distribute the pro-

gram for them. Stewart Publishing usually picks up programs which, although useful, have a limited sales potential and, therefore, do not justify the expensive marketing and promotion allotted programs with a wider distribution potential.

Schools as Marketing Agencies

More and more schools are acting as their own marketing and distribution agent for videodisc programs developed in-house. The first, and perhaps most successful, of these is the University of Washington (UW). UW has produced a total of 11 programs, most of them "generic," on topics covering trauma training, microscopy, hematology, and neurology. The price of these discs range from $175 to $300. These discs contain medical images and are not sold with any type of instructional programming. This is left to the purchaser to develop.

The UW has been successful selling these discs because 1) the discs themselves were of high production quality, 2) they were generic discs (images only, no programming) which prevents running into the "not invented here" syndrome, and 3) they kept their overhead low. Because the total sales of any one disc ranges between 100 and 300 copies, there isn't any margin for expensive marketing.

Most schools, however, have only one or two videodisc programs to offer, and realize that their program has a limited audience. Their marketing efforts usually are limited to word-of-mouth and occasional brochures. These schools, because of the low volume of sales, are able to handle the packaging, distribution, and product support themselves. One of the more successful schools in this category is the University of Utah, which has been selling the shared disc *Slice of Life*. Developed by the Pathology Department, in conjunction with Media Services, sales and distribution are handled by the health sciences library. Marketing assistance is provided by the Interactive Healthcare Consortium in return for a discount to members, and a portion of the sales goes to the library to cover their administrative costs.

Other schools who, in the past, have sold their own videodisc programs include the County College of Morris in Randolph, New Jersey, Simon Fraser University in Burnaby, Canada, University of Colorado Health Sciences Center, and the University of Georgia Department of Veterinary Medicine. Recently, many more schools are developing and selling their own programs, including Auburn University, British Columbia Institute of Technology, California State University-Chico, San Diego State University, University of Iowa, University of Maryland, University of South Alabama, University of Southern California, and University of Texas.

Videodisc Consortium

In 1987 five different resource sharing groups were formed, independently, to assist in the development and distribution of health-related videodisc courseware: the IBM-sponsored Healthcare Interactive Videodisc Consortium (HCIVC), Interactive Healthcare Consortium (formerly the MDR Videodisc Consortium), Fuld Institute for Technology in Nursing Education (FITNE), Medical Interactive Video Consortium (MIVC), and Consortium of North American Veterinary Interactive New Concept Education (CONVINCE).

Healthcare Interactive Videodisc Consortium (HCIVC)

In the fall of 1987, IBM helped 17 U.S. and Canadian medical and nursing schools form a self-governing organization to develop interactive videodisc courseware. Each member of the Healthcare Interactive Videodisc Consortium (HCIVC) is committed to produce five interactive videodisc instruction modules by mid-1990, for a total consortium library of 85 modules. Three IBM groups, Academic Information Systems (ACIS) in the U.S. and Canada, and MulitMedia Solutions (MMS), are providing financial and technical support.

The consortium meets twice a year to conduct organizational business and review each other's modules. Members use IBM's private computer network, InfoNet, to communicate with each other and with on-line IBM technical experts and trouble-shooters. IBM MultiMedia Solutions, in Atlanta, provides educational and technical support on the use of the InfoWindow systems and IBM's authoring systems.

Courseware Publication and Distribution. The Health Sciences Consortium (HSC), a non-profit publishing cooperative, has been chosen as the publisher for many of the HCIVC courseware. Anticipated prices for the programs are $650 for HSC members and $1,300 for nonmembers. Additional copies of any videodisc are expected to cost $125 for HSC members and $250 for nonmembers. HSC institutional membership is $1,000 for one year, $2,000 for three years, and $5,000 lifetime.

Interactive Healthcare Consortium

The Interactive Healthcare Consortium (formerly the MDR Videodisc Consortium) was formed by Stewart Publishing at the request of individuals in health sciences schools, many of whom attended the general meeting of the Medical Interactive Video Consortium in October but were excluded from active membership because their fields of study were non-medical (nursing, dentistry, allied health, etc.) The IHC is an educational publishing cooperative dedicated to the development and distribution of interactive videodisc courseware in healthcare. Membership includes schools of medicine, nursing, dentistry, allied health, pharmacy, and public health as well as hospitals, professional organizations, and pharmaceutical companies.

IHC members are entitled to a number of benefits, including a free subscription to the *Interactive Healthcare Newsletter,* discounts of 10 to 20 percent on selected commercial videodisc programs, discounts of 15 percent or more on other commercial products such as videodisc players, hardware systems, authoring systems, and other design and development software, and 20 percent discount off all products and publications offered by Stewart Publishing. In addition, the IHC will assist in the marketing and distribution of interactive video courseware developed by member schools.

The IHC also organizes a shared videodisc entitled *Resources in Medical Education,* which contains material contributed by health sciences schools. *Resources* is used as a generic videodisc for repurposing by other health sciences schools and is updated periodically to allow additional contributions.

Membership in the IHC is $300 per year, $150 for schools of nursing and community colleges. As of January 1990, there were approximately 100 members in the United States and Canada.

Fuld Institute for Technology in Nursing Education

The Helene Fuld Health Trust is the largest private foundation in this country that directly supports nursing education. In the fall of 1987, the Trust established the Fuld Institute for Technology in Nursing Education (FITNE). FITNE is a separate entity from the Helene Fuld Health Trust and concentrates specifically on the use of technology in nursing education.

FITNE is a membership organization, with an institutional membership fee of $300 per year and an individual membership fee of $85 per year. Owned by the nursing community and designed to directly serve the technological needs of nursing education. It provides a clearinghouse for educational software and hardware through reviews and evaluation of software and hardware systems. Another aspect of the institute is to negotiate attractive pricing for members on software and hardware. FITNE's information dissemination system includes a newsletter, electronic bulletin board, and CAI development and application workshops.

Hardware Grants. Perhaps the most significant contribution by FITNE to date is the impact it is having on the placement of interactive video hardware systems in schools of nursing. In 1988, the Helene Fuld Health Trust, through the FITNE, selected 46 schools of nursing across the U.S. and Canada to become the first interactive video demonstration centers to receive InfoWindow-compatible FITNE interactive video systems.

The Institute's goal was to encourage commercial producers to devote more effort toward the production of instructional programs applicable to nursing education and to provide cost savings to FITNE members who purchase the hardware and software developed by the Institute. Two FITNE Interactive Video Systems were provided to schools with more than 100 full-time nursing students, and schools with less than 100 full-time students received one system. Schools also received a copy of the interactive video instructional program *Intravenous Therapy*, distributed by FITNE. All schools will participate in data collection and evaluation for three years.

The placement of these systems and others FITNE shipped during 1988 meant there were more than 100 identical pieces of hardware in over 60 schools by the end of the year. In addition, the Helene Fuld Health Trust will continue to make hardware grants to nursing schools each year, adding to the number of compatible interactive video systems placed in this market.

Active Schools and Colleges

Bloomsburg University

A Center for Instructional Systems Development was established at Bloomsburg University in Pennsylvania--thanks to funding by the Ben Franklin Advanced Technology Partnership. The purpose of the center is threefold: 1) to support the design and development of computer-based interactive videodisc courseware for interested Bloomsburg University faculty, 2) to serve as a vehicle for partnership by seeking and supporting interactive videodisc projects for private sector entities through grants and sponsorships, and 3) to coordinate and cooperate with the College of Graduate Studies and Extended Programs in supporting human resource development in the Instructional Technology

Master's Degree Program and Extended Educational Programs for corporate business sector training.

The initial award of $66,131 was for the university to work cooperatively with the Geisinger Medical Management Corporation to develop model courseware for the training and retraining of nurses and physicians in critical care medicine. The following projects were completed:

Use of M.A.S.T. was developed using the Department of Transportation's objectives for pre-hospital personnel. The lesson is divided into eleven sections dealing with a different aspect of the M.A.S.T. The lesson has been tested with fifteen paramedics and EMT's.

Crisis Management of the Ventilated Patient consists of six simulated cases that give the nurses "hands-on" experience in the care of mechanically ventilated patients. Each case deals with a potentially life-threatening problem which these types of patients are especially prone to. The lesson is menu-driven and has extensive help options that allow the user to interrupt the lesson at any time for additional information.

Poison Prevention is a lesson developed in cooperation with the Geisinger Poison Center. The lesson was developed for five to seven year old children and is currently being used by the Poison Center staff for visiting school groups.

AIDS Education is an interactive video lesson for rural students between the ages of eleven and fourteen years old. The program presents information about the Acquired Immune Deficiency Syndrome. The information is necessary as the students are expected to change or avoid behaviors which spread the AIDS virus. The videodisc was designed not only to provide facts on AIDS and how it is spread, but also to stimulate active student participation in the decision-making process. Realistic scenarios provide students with the opportunity to practice making difficult decisions that they someday may face in their own personal relationships.

Nurse Triage in the Emergency Room is a lesson that will provide students guidance and practice in the placing patients from an emergency room environment into the treatment categories. Proper placement will insure that treatment and medical diagnosis can take place in a timely and efficient manner.

Procedures in Critical Care is a companion disc to *Crisis Management of the Ventilated Patient*. This disc illustrates nursing skills and procedures that are necessary for the care of the critically-ill patient. The student controls the rate of information delivery and practice. Feedback generated by the computer further reinforces the learning.

British Columbia Institute of Technology

The British Columbia Institute of Technology (BCIT) has produced two videodiscs, one in heart anatomy and physiology and the other in radiology. *A Test Disc on Medical Radiology* is a prototype project exploring the use of videodisc for projecting radiographs in the classroom. The disc explores the use of still-frame transfer technology as a way of using videodiscs in the classroom. X-rays were transferred to video still frame using a Sony Mavica, which writes video signals to a 1-1/4-inch diskette. Each disk stores up to 50 frames which were then transferred to videodisc. The images are then played back in the classroom using a Sony Superbright projector.

Anatomy and Physiology of the Heart is a thirty-minute videodisc filled with several short introductory clips, video of surgical procedures, autopsy, moving medical images

such as ultrasound, magnetic resonance imaging, or nuclear medicine, and a wide variety of anatomical specimens. These images are blended together with extensive computer graphics and text to portray each topic through a number of presentations of varying depth and speed. The program is comprised of 25 modules which cover six major themes: Cardiac Basics, Anatomy of the Heart, Cardiac Cycle - Mechanical, Cardiac Cycle - Electrical, Regulation of Cardiac Output, and Common Cardiac Pathologies. While each of the six themes is treated with an introduction, each of the 25 topics is presented through five venues:

Overview. This video clip introduces the topic showing its relevance and scope. It serves as an advanced organizer and presents many of the images which will be studied in greater detail in other venues.

Presentation. This covers the actual material to be learned. There is interaction with the material through the touchscreen approximately every 20 seconds. Relevant animations, computer simulations, and still images (with graphic overlay) are used as required.

Exploration. While the presentation deals with "need to know" material, the exploration deals with "nice-to-know" information and provides additional examples or views of medical imaging to supplement the topic.

Summary. This is a one- or two-page precis of the key points in the presentation. Students particularly like the summary when preparing for examinations.

Test. While review questions are given throughout the presentation, the test section provides access to an extensive test-item bank dealing with the topic. Since questions are drawn at random and the distractors appear in scrambled order, a wide variety of multiple-choice, labelling, or matching questions may be seen.

Cornell University

Cornell University Medical College, in conjunction with a grant from the National Institute of Mental Health, produced a videodisc program titled *An Interactive Video Course on AIDS*. The program is recommended for use in an AIDS-related clinic and is designed to gather and disseminate psychological, medical, and therapeutic information from/to AIDS Antibody Blood Test recipients. The course is part of a three-armed study to determine the effectiveness of a program designed to counsel and educate people who undergo blood testing for AIDS virus antibodies. The program also collects information from its viewers to determine a baseline of knowledge on the viewer regarding the full spectrum about AIDS and the antibody test.

Interviewing Skills. Another program produced at Cornell is *An Interactive Video Program for Teaching Interviewing to Medical Students*. This is part of a Cornell Grant project to determine the usefulness of interactive video as an educational tool, specifically with teaching interviewing to medical students. The content shows segments of a physician/patient interview (staged) and asks the medical student to analyze each and respond to its appropriateness within their notion of what a patient interview should include, should not include, and the order in which information should be gathered.

County College of Morris

The County College of Morris has developed a videodisc-based patient simulation for nurses, *Nursing Decisions: A Postoperative Patient*. The program allows the learner

to exercise options, implement decisions, and follow up the results of those decisions free of the restraints imposed in most clinical teaching situations. By recording learner responses in computer memory, it also enables an instructor to review and evaluate the learner's performance in the simulation.

The videodisc depicts four postoperative situations and a client chart. Mrs. Morris, a postoperative cholecystectomy patient, presents symptoms common to many patients following abdominal surgery. Using the disc, the learner collects clinical data, analyzes the situation, makes decisions, and sees the results of those decisions depicted on the screen. Following the branching paths of the options presented, the learner actively applies and builds on his or her clinical knowledge to achieve a satisfactory outcome for Mrs. Morris. The four situations include: 1) a postoperative assessment on the day of surgery, 2) a focused oxygen assessment on the first postoperative day, 3) an intravenous therapy assessment on the third postoperative day, and 4) a health status assessment on the fourth postoperative day.

Florida State University

The Center for Educational Technology at Florida State University produced at least one videodisc program, *Human Genetics Training For Nurses*, in 1982 as part of the Children's Medical Services series. The program was designed to instruct nurses and associated health professionals in genetic diseases and disorders, as well as the nursing support role.

Hocking Technical College

The Department of Nursing at Hocking Technical College has developed three interactive videodisc programs for nursing students. Each of the programs plays on a Level III system made up of a Pioneer videodisc player, IBM PC or compatible, VAL Microkey graphics overlay card, and a Sony PVM or Zenith monitor equipped with a Microtouch touchscreen.

Intravenous Therapy. This program is designed to teach clinical skills to nursing students. It contains six chapters: 1) IV Solutions, 2) Preparing Solution and Tubing, 3) Insertion of the IV Needle, 4) Maintaining the IV Solution, 5) Discontinuing the IV Solution, and 6) Complications of IV Therapy. The program includes some knowledge evaluations such as flow rates, order interpretation, and equipment identification.

Bedmaking. This program shows nursing students making an unoccupied bed. After each step the program pauses to give the student the opportunity to review the step or to continue with the lesson. The program is being used in the Interactive Skills Laboratory which contains seven workstations equipped with videodisc system and bed. The students use the disc while practicing. They can review elements such as mitered corners, and can stop the action, repeat, and review each step. Approximately 10 minutes running video.

Principles of Sterile Technique. This program has three parts: 1) A vocabulary section introduces the student to terminology, followed by a quiz. 2) A video segment illustrates ten principles of sterile technique. At the end of each principle the student has the opportunity to review or go on with the lesson. 3) Visual quiz. The student looks at a short vignette and has to decide what principle has been violated. If he answers incor-

rectly, he is given the chance to try again. If still wrong, the vignette is shown again. This program is shown to students before teaching them procedures requiring sterile technique and takes the place of classroom lectures. It may also be used as remediation later if students have trouble performing procedures properly.

Louisiana State University

The Louisiana State University Medical Center is creating a series of interactive videodisc modules to help medical students develop basic skills for conducting initial psychiatric interviews. Building on actual videotaped cases, the interactive videos bridge a gap between classroom instruction and real interviews on "rounds." One module teaches skills for active listening, directing an interview, gaining rapport, and observing non-verbal communication.

The Initial Psychiatric Interview is a set of interactive videos based on subject matter in actual case videotapes. Designed mainly for medical students, the series also has value for graduate education, social and pastoral care work, and other allied health fields. One module is already completed, one designed to teach skills in listening, directing and interview, gaining rapport, and observing non-verbal communication.

The decision was made to use an actual videotaped patient interview as a basis for content. The first task was to transcribe the videotape and prepare a rough script. Then a road map was charted, creating basic pathways for each of the four objectives: listening, rapport, interview technique, and non-verbal communication. The idea was to take the student down each path with motion video of the interview plus interactive questions and responses, and also to offer the complete, uninterrupted interview for review and voice-over commentary.

Once the motion video was shot, the team finished editing the video and audio tracks and integrated all introductory, how-to, graphics, and commentary material. Also added were a HELP function, a CONTINUE function to skip the introduction, a glossary of terms, and provision for a student ID number. The module was produced at an estimated cost of more than $50,000, plus the time of the subject matter expert, Dr. Paul Ware.

Ohio State University

The Office of Academic Services for Medical Education at the Ohio State University is developing a series of interactive videodisc programs on gross anatomy. The program series, entitled *Anatlab*, is designed to supplement the lab work in anatomy for the allied health professions. If successful, Anatlab will reduce the costs associated with the traditional anatomy courses by decreasing the number of teaching assistants and cadavers required for instruction.

To determine the effectiveness of *Anatlab*, half of the students in three gross anatomy classes were randomly assigned to either a computer lab or the traditional cadaver lab. The computer lab videodisc includes everything the students would see in the actual lab. In addition, the interactive tutorial is written to simulate the kind of student-teacher conversations that usually occur during the three-hour lab covering the same material.

One week after the lab experience, each class was tested in an unannounced lab practical. Even though they were tested on the unfamiliar cadaver, in two of three

classes, the students trained with the computer lab scored as well as the cadaver lab trained students.

Anatlab is the second videodisc produced by The Ohio State University College of Medicine and represents the combined efforts of several departments. The medical school's CAI center contains several hundred hours of programmed instruction, many incorporating videodisc still images, motion sequences, and sound. Student carrels are configured with IBM AT's, Sony or Pioneer videodisc players, and Sony video monitors.

San Diego State University

The San Diego State University School of Nursing has developed the videodisc program *The Story of Maria* to provide pregnant women with information on infant feeding. The Level III program was designed for use by Hispanic women and dramatizes the experience of a young first-time pregnant woman as she engages in the decision-making process regarding her choice of infant feeding. The user can follow Maria through the process of breast and bottle feeding and compare and contrast the two methods. Through the interactive component of the program, the user becomes actively involved in the issues faced by Maria, is able to internalize the information, and make informed choices about applying the knowledge to her own life. The program can be used in Spanish or English.

Stanford University

An electronic textbook developed by Stanford University Medical Center researchers could aid students trying to master the complexities of human anatomy. Combining text, computer graphics and full-color video, *The Electric Cadaver* allows a user to interactively explore the structure of the human body in a way unavailable in conventional printed books. The system displays images on two screens, one for computer graphics, the other for full-color video. A user can "jump" from picture to text to video and back, just as a reader jumps from place to place in a printed volume. *The Electric Cadaver* allows students to move beyond the lecture, printed page, and laboratory to the domain of interactive self-study.

David Bassett, M.D., a Professor of Anatomy at Stanford and the University of Washington, spent 15 years creating the anatomical images that form the core of *The Electric Cadaver*'s visual database. In collaboration with William Gruber, the inventor of the View-Master Stereo Slide System, Bassett worked through the 1940s and 1950s preparing 1600 pairs of stereo slides, originally published on ViewMaster reels in the *Stereo Atlas of Human Anatomy*. After Bassett's death in 1966, the collection fell into obscurity, despite their unique quality and comprehensiveness. Several years ago, at Dr. Robert Chase's urging, Bassett's wife, Lucile, reclaimed the original images and lent them to Stanford University. *The Electric Cadaver* will be released by medical publisher Williams and Wilkins for use on the Apple Macintosh computer sometime in 1990..

Thomas Jefferson University

Administering Therapeutic Agents. Thomas Jefferson University has developed an interactive videodisc learning package to assist nurses and other health care professionals in acquiring the knowledge base and psychomotor skills necessary to safely and effec-

tively administer therapeutic agents to clients. This program facilitates decision making related to the total process of medication administration.

University of Cincinnati

The Computer-based Instructional Systems Department at the University of Cincinnati is developing a series of interactive videodiscs to teach undergraduate nursing students the skills needed to work with diabetic patients. *Balancing for Diabetic Control* presents two case studies via videodisc, with the primary case concerning an adolescent patient. Decisions are required by the student regarding the hyper- or hypoglycemic status of the patient. Various adolescent concerns (such as alcohol, drugs, and exercise) can be explored through the use of the videodisc by viewing actual outcomes of selected behaviors.

Health Assessment of the Diabetic Patient allows students to practice interviewing skills. Various slides illustrate the possible abnormalities that can be seen during the physical examination and are often contrasted with normal findings. Although based on one patient situation, the program can be used as a Level II disc to illustrate abnormal findings possible with diabetic patients.

Labor and Delivery. The College of Nursing and Health at the University of Cincinnati has developed a videodisc simulation designed to bridge the gap between classroom and clinical experiences in labor and delivery. The opening sequence of the simulation immediately immerses student nurses in a drama they may face as professionals: a birth is imminent, but other doctors and nurses are tied-up with an emergency Caesarean section. Alone, the nurse must attend to a patient about to deliver.

The case study uses video to introduce the user to the laboring patient and her husband as she is being admitted to the hospital. As the case unfolds, the student selects information for assessment purposes and, in some cases, is required to actively participate in the data collection process. As labor progresses on an hourly basis, the student selects appropriate interventions based on identified nursing diagnoses. The first module of this two-part program ends with the delivery of the infant. The second module guides students through the process of providing family-oriented nursing care immediately following the birth of the infant.

In an effort to capitalize on the strengths of videodisc technology, the developers focused on the visual, tactile, and auditory capabilities of the InfoWindow system. Examples of the visual information shown include graphic overlay of the fetus over the mother's abdomen, fetal monitor assessments, varying patient behavior during labor and delivery, placenta examination, APGAR scoring, position and descent of the fetus into the birth canal, graphics of clinical data, and patient support measures. Tactile demonstrations were best used in the simulation for the vaginal examination for cervical dilation, hand placement for examination for Leopold's maneuvers, and scrub sequencing in preparation for delivery. Auditory highlights include the sounds of labor, delivery, bonding, the newborn cry, verbal cues, and determination of both fetal and newborn heart rates.

Students work their way through a case study on the videodisc system that condenses a normal 14- to 24-hour labor into a two- to four-hour learning experience. The program prompts students to use their judgment and problem-solving skills to perform interventions when necessary, and advises them whether or not they made appropriate choices.

University of Delaware

The University of Delaware College of Nursing has developed an interactive videodisc series focusing on bereavement support. *Death: Perspectives for Clinical Practice* is composed of five interrelated units which encompass the cognitive and affective components of bereavement counselling. The series also provides opportunities for the implementation of support strategies in a simulated clinical setting.

The foci of this Level Three interactive videodisc series are: 1) the exploration of the learners' death-related beliefs and experiences as they impact on clinical practice, 2) the acquisition and/or review of information relating to death-related issues including the grief process, 3) the acquisition of information related to bereavement support strategies, and 4) the integration of personal awareness and didactic learning in the facilitation of the grief process.

Societal Symbols of Death and Grief. An examination of the symbols used by society to memorialize the dead provides insight and a historical perspective to how death and grief are viewed by society.

Arrangements Following a Death. The purpose of this unit is twofold: 1) to give healthcare providers a body of factual information related to the whole process of body disposition and associated arrangements, and 2) to sensitize healthcare providers to the immediate decisions facing survivors and to the fact that these decisions are influenced by cultural and religious beliefs.

Death-related Legal Issues. This unit also has a dual purpose: 1) to provide healthcare providers with a body of factual information regarding legal issues relating to death, and 2) to help the learners identify their personal reactions to death-related legal situations.

Death Ceremonies and Rituals. This unit is designed to provide both factual and experiential information about funeral ceremonies and customs of a selected number of religious and cultural groups.

Bereavement Support Strategies. This unit both explains and demonstrates selected support strategies for healthcare providers to use when interacting with bereaved individuals. The demonstrations exemplify the use of six strategies as they are implemented in a case example that spans the grief process from the pronouncement of death to eighteen months later.

University of Hawaii

The University of Hawaii School of Medicine has developed a program entitled *Cyanotic Premature Babies* designed to assist medical students and pediatric residents with diagnosis and management of premature infants exhibiting cyanosis. The program consists of six diverse case simulations, with additional information available on diagnosis, procedures, and relevant drugs.

Respiratory difficulties accompanied by cyanosis are a common problem in premature infants at or just after birth. However, the full diversity of causes is rarely seen in a short training period. This program was developed to assist students and residents with the diagnosis and management of a variety of conditions which they may not see during their training.

The program begins with a menu which permits selection from six cases covering the following: a congenital heart disorder, sepsis/pneumonia, persistent fetal circulation, diaphragmatic hernia, tracheo-esophageal fistula, and respiratory distress syndrome proceeding through patient ductus arteriosus to pneumothorax.

In each case the student is provided with relevant introductory information and must then proceed with diagnosis and management. At each decision point the student may view information about relevant procedures, obtain assistance with diagnosis, or see information about useful drugs. Segments between decision points may be repeated if required. Provision is made for review of instructional segments.

Cyanotic Premature Babies was authored using IBM InfoWindow Presentation System and run on InfoWindow or compatible systems. The extensive graphics in the program were developed with Storyboard Plus using 640x350 resolution mode. This program is one of a number being developed for the Health Sciences Interactive Videodisc Consortium and was funded, in part, by the IBM Corporation. The University of Hawaii is preparing five modules for the HCIVC: *Cyanotic Premature Babies I & II* and *Procedures in Pediatrics I, II,* and *III*. The first two modules consist of six case studies that require students to make decisions on managing a patient by selecting from menus on the videodisc touchscreen.

University of Iowa

One of the first to develop computer-controlled videodisc instruction for the health sciences was the Weeg Computing Center at the University of Iowa. The Center has developed at least four interactive programs for health professionals. Two early videodiscs, *Gynecology Patient Education* and *Urology Retrieval*, were developed in 1982 and intended as research and development projects. The gynecology project was designed to introduce cervical cancer patients to the treatment they would receive at University Hospitals, while the urology disc demonstrated a videodisc-based information storage and retrieval system. Because of the experimental nature of the projects, neither disc is available to the public, but may be viewed at the Weeg Center.

The third videodisc produced by the Center has been the recipient of several awards, including a "Best Educational Production" award by the Nebraska Videodisc Group. *Assessment of Neuromotor Dysfunction in Infants* is designed to teach health professionals to identify early signs of neuromuscular dysfunction on the basis of five parameters: muscle function, reflexes, movement, structure, and gross motor skills. The latest project from the Weeg Center is *Lamaze: The Nurse's Role*, which presents the principles of the Lamaze method of childbirth to nurses and nursing students. The disc was produced as a joint project of the College of Nursing and the Weeg Computing Center under a special projects grant titled "The Use of Microcomputers in Continuing Nursing Education."

University of Puget Sound

A videodisc-based tutorial on biomechanics for allied health students has been developed at the University of Puget Sound in Tacoma, Washington under a grant from the Health Foundation. The purpose of the program is to provide occupational and physical therapy students with supplemental experiences in a required anatomy/biomechanics/-ki-

nesiology course. Although some students have taken college physics as a preparatory course, others have not and experience difficulty grasping concepts of forces, vectors, torque, etc. without this background.

The program begins with an introduction designed to heighten the students' attention and explain the procedures used in the tutorial. A topics menu is then presented which includes Forces, Vectors, Laws of Motion, and Torque. Students have constant access to a glossary which gives definitions and further background information on terminology and principles which are presented during the tutorial.

In the presentation of material, students are shown examples of the concepts discussed through video scenes of human action as well as graphics and animations. Throughout, students are asked to work practice questions based on the video images, and are given detailed feedback according to their answers. At the end of each sub-unit students are given a quiz, which the computer grades. When the student feels ready, the post-test is given and graded.

The tutorial runs on a Macintosh computer using the Beatles movie *Help!* produced by the Criterion Corporation. Authoring was done using the *Course of Action.* The second phase of the Health Foundation grant will be the production of a teaching module on the early assessment of movement in infants to identify children at risk of developing motor handicaps.

University of Southern California-Los Angeles

The Annenberg School of Communications at the University of Southern California, Los Angeles, has produced a videodisc on hairloss, one side effect of some treatments for cancer. It is currently under evaluation at the Cedars-Sinai Comprehensive Cancer Center, and will shortly be in three other Southern California sites.

The disc offers chapters which answer the following questions: 1) What causes hair loss?, 2) How will hair loss happen, and what to do about it?, 3) How will hair loss feel physically?, 4) How will hair loss affect feelings, family, and friends?.

After the user chooses a chapter, he or she is then asked to pick a level of information, General, Detailed, or chapters designed for "significant others," close friends, and family members of the cancer patient.

University of Texas Medical Branch (Galveston)

An interactive videodisc program has been developed by the University of Texas Medical Branch in Galveston, Texas which is designed to increase awareness regarding older adults. The program, *Health Care of Older Adults: An Overview for Nurses* was developed for a primary audience of practicing nurses and is intended to impact on their attitudes toward the healthcare needs and problems of a geriatric population.

The production of the videodisc was supported in part by the Division of Nursing, United States Public Health Service, Department of Health and Human Services, in Washington, DC, and by the IBM Corporation as part of a healthcare videodisc consortium project. The instructional content of the program relates to geriatrics and gerontology and is divided into seven modules: 1) Nutrition and Health Promotion, 2) Ethical and Legal Issues, 3) Facts and Figures on Aging, 4) Theories of Aging, 5) Aging and the Humanities, 6) Normal Aging Process, and 7) Physical Assessment.

University of Texas – MD Anderson Cancer Center (Houston)

Two interactive videodisc modules have been completed at the University of Texas MD Anderson Cancer Center. *Care of the Immuno-suppressed Oncology Patient* helps nurses learn to recognize and treat symptoms of infection in cancer patients. *Perspectives in Diagnosing and Treating Breast Cancer* helps keep the practicing physician informed of recent developments.

The first module developed, *Care of the Immuno-suppressed Oncology Patient*, is a self-paced interactive video designed to help nurses assess and manage infections. Nurses play a critical role in managing the side effects and toxic effects of cancer and its treatment, with infection the number one threat. Often the symptoms of the infection are very subtle and are not easily taught in the classroom.

The module shows an actual video sequence of a nurse interviewing a patient and making a hands-on-assessment. The student can choose from five program branches based on the ADPIE Nursing Process Model: assessment, diagnosis, planning, implementation, and evaluation. Each path allows the student to investigate the content in depth. For example, assessment of the patient has three instructional layers: patient vital signs, history taking, and physical examination of 11 body sites.

At various stages the student is asked to make decisions. Should the physician be called? What is the risk of infection? Video motion and graphics reinforce correct choices in diagnosis testing and other areas, with explanations for incorrect choices. The student nurse is also asked to indicate reasons why correct choices were made, again to reinforce learning.

MD Anderson's second module is *Perspectives in Diagnosing and Treating Breast Cancer*. This module is for the practicing physician who wishes to become more familiar with the latest information on diagnosis and treatment. Its main interactive pathways are three prepared case studies and a branch for the physician to construct an individual case study. Supplementary material includes epidemiology, a bibliography, and background on a 90-minute national teleconference used for content of the prepared case studies.

University of Washington

The Health Sciences Center for Educational Resources at the University of Washington is marketing six of their medical videodiscs. They are produced as multi-use or generic discs to allow individuals and institutions to tailor their instruction to the needs of their particular site. Each disc may be played on any optical reflective disc player.

Medical Applications Videodisc: Hematology was originally published in 1982 and was one of the first to be distributed to the Miles Laboratory's Learning Centers. The second edition contains more than 6000 slides, including those from the American Society of Hematology morphology collection (2674 frames), the World Health Organization International Histologic Classification of Tumors (1866 frames), and Selected frames from the Western Universities Physical Diagnosis Slide Bank (1782 frames).

Acute Leukemia Morphology II is a one-sided disc that contains numerous exemplary peripheral blood smears, bone marrows, and special stains for instruction and reference in the differentiation of the acute leukemias. Scans of the material at various powers augment the study of the still microscopic features of the cases in question.

Disorders of the Nervous System: Motor is a compilation of materials from a "visual glossary" collection of neurological dysfunction. Normal and abnormal gaits and reflexes are demonstrated as well as a wide variety of motor signs and disorders.

Disorders of the Nervous System: Mentation is a compilation of material from a "visual glossary" collection of neurological dysfunction. Included are six patients who demonstrate a variety of disorders of mentation.

Trauma Training Materials I and II: These two discs (three sides) demonstrate basic techniques that must be mastered by a trauma care team working in an emergency room setting.

Laboratory Medicine Video Library: Atlas of Hematology: This one-sided disc contains over 6000 stills and scans recorded directly though the microscope and forms a comprehensive library of hematologic findings which can be used for education, testing, and reference. All material is SNOMED encoded to facilitate access.

Cardiovascular Resources Videodisc contains a large collection of materials that may be used to teach cardiovascular nursing and medicine. The collection includes approximately 4000 slides covering anatomy, physiology, embryology, microscopic and gross pathology, introduction to care environment and common techniques in the assessment and treatment of cardiovascular disorders.

All of these videodiscs come with a catalog of images that allows rapid access for lecture demonstration or self-study, as well as the compilation of written or computerized instructional programs.

Hypertext Software. The University of Washington has produced hypermedia software to accompany two of their generic videodiscs. The programs are written for Owl International's *Guide*.

Acute Leukemia Morphology—Guide is an interactive Guide program that allows the student to compare and contrast the Acute leukemias by classification (M1-M6 & L1-L3). Major morphological and staining characteristics may be viewed on the videodisc. Patient information accompanies each example. The program sells for $99 and operates with Pioneer LD-V6000 series videodisc players and the videodisc *Medical Applications Videodisc: Hematology 2nd Edition*.

Laboratory Medicine Acute Leukemia Series is a series of three Guide programs that allow the student to interactively explore the Acute Non-lymphocytic leukemias, Hairy Cell Leukemia, and Multiple Myeloma. Each program contains material on the laboratory presentation and morphology of the disease, special stains and staining characteristics, and pertinent references. Sells for $99 and operates with Pioneer LD-V6000 series videodisc players and the videodisc *Laboratory Medicine Video Library: Atlas of Hematology*.

University of West Florida

The Office for Interactive Technology at the University of West Florida was selected in 1981 to design and produce the series of programs on Aid to Families with Dependent Children (AFDC) for the Florida Department of Health and Rehabilitative Services (HRS). The program was designed to train newly-hired workers (approximately 500 annually) to be Public Assistance Eligibility Specialists who determine whether applicants are eligible to participate in the AFDC program. The completed package consists of 160 hours of in-

struction, nine videodisc sides, 78 floppy diskettes, eight printed reference books, and an extensive trainer's guide.

The OIT also produced *Court Testimony and Documentation* in 1983 for the Children's Medical Services Program of the HRS.. The program was designed to provide Child Protection Teams (multi-disciplinary team that deals with child abuse) with skills in court testimony and documentation.

Chapter 4

Commercial Ventures

1988-1989 seems to have been a growth period for commercial videodisc development, doubling the number of vendors who have a health-related project to offer. With this growth there also seems to be some hardware stability with the IBM InfoWindow system.

New Trends in Hardware

There finally seems to be a "shakedown" in the industry regarding hardware systems. Vendors today are going one of two routes: market their programs on a inexpensive, custom-built, dedicated videodisc system, or on one or more of the standard integrated systems such as the IBM InfoWindow or Sony View system. A few vendors are doing both.

In the past, hardware systems have been one of the biggest problems for the software vendors to deal with. Compatibility was a concern because buyers hesitated to purchase a non-standard system on which they would not be able to play other commercial programs. Today, this problem is being taken care of by the emergence of a few dominant systems and the willingness of most software vendors to adapt their programs for several configurations.

Integrated Hardware Systems

Integrated systems are hardware units where all components are sold together as a package: computer, videodisc player, monitor, graphic overlay, touchscreen, etc. Two main advantages of this type of system is assurance that all components will work together and the fact that there is only one dealer to call if anything fails to operate.

Until the introduction of the IBM InfoWindow, there was no standard hardware configuration in the industry. Now it appears that the InfoWindow is quickly becoming the standard, with other configurations keeping a few specialized industry niches. As evidence of this trend, of 72 Level III commercial programs listed in the 1989 *MedicalDisc Directory* (Stewart Publishing, Inc.), all but four played on an InfoWindow or compatible system. The four which played only on a proprietary system were developed by Actronics for their CPR Learning System. Many of the InfoWindow-compatible programs also were programmed to play on various other configurations, but no one system is as universally accepted as the InfoWindow.

Commercial Programs Listed in the 1989 MedicalDisc Directory

Type of System	Number of Programs
InfoWindow-compatible	68
Actronics	4
Two-screen PC	5
Two-screen Macintosh	0
Level II	6
Level I	11
Total	94

Two-screen Systems

Although the InfoWindow is the leading system for "off-the-shelf" courseware, the type of delivery systems used in the healthcare market will vary according to subject matter and setting. In some of the medical specialties which have large collections of still images (radiology, pathology, hematology), two-screen systems, costing as little as $1,500, may remain in favor for some time. In these disciplines, users are content to have the medical image appear on one screen while descriptive text and graphics appear on the computer screen. For most applications, there is no need for graphic overlay, touchscreen, or other features offered by the more expensive InfoWinldow platform.

Level One Systems

Many commercial applications are presented on Level One videodisc systems. The successful RAVEN system for ophthalmology patient education was an inexpensive, practical combination of hardware and software which used a customized keypad to access one or more of 28 different video segments. The newest variation of Level One delivery is the laser barcode reader, available in the past, but recently made more accessible by Pioneer Communications. The first health-related commercial application using this technology has been produced by the American College of Radiology (ACR). The ACR is producing a series of videodiscs which are accompanied by a barcoded workbook and scanning wand, eliminating the need for even a computer. The total cost of a Pioneer LD-V2200 videodisc player and scanning wand, and is less than $1,000.

Companies & Products

Actronics, Inc.

Actronics was the first commercial company to be formed for the purpose of developing and marketing health-related videodisc programs. Under license to the American Heart Association, Actronics was formed in 1983 to market the well-known CPR system developed by David Hon when he was National Training Manager at the AHA.

The CPR/ACLS Learning System consists of an Apple IIe computer, Sony or Pioneer videodisc player, a random-access audio cassette player, and electronic manikins

which are interfaced with the computer. This dedicated system sells for $12,895, with programs ranging in cost from $8500 for *CPR* to $995 for *AIDS Information*.

Sales of the CPR/ACLS Learning System have reached approximately 300 units at 250 locations, with sales being slowed by problems common to all videodisc hardware vendors. However, Actronics Vice Chairman Danny Cassidy, M.D., reports that sales have increased recently as the result of new marketing efforts outside the hospital community. Apparently, many of the barriers to sales found in hospitals do not exist in corporate and industry settings. See Chapters 4 and 5 for more detail.

How The System Works

The program presents "classroom" material using the videodisc player and audiocassette player. Using a light pen, learners can evaluate their progress by taking short quizzes at the end of each section. Based upon this evaluation, appropriate video segments are selected by the student to provide review sequences and more in-depth instruction. At all times, the program provides continuous and immediate feedback.

Most impressive is the ability of the system to monitor the learner's actions using one of the CPR manikins. The manikins are equipped with sensors and activators to provide feedback to the student and monitor performance on all components of CPR procedures, including pulse check, call for help, chest compressions, back blows, ventilations, open airway, etc. As with the live instruction, the program will provide on-going feedback while the student works with the manikin. The System will "coach" the learner by 1) producing audio tones to indicate proper timing of each compression and 2) displaying a graphic summary on the monitor which details the learners overall performance. During practice, the student's performance on the manikin is immediately evaluated by the computer, which, if needed, selects the appropriate coaching responses from the videodisc.

At the end of the lesson material and practice sessions, the learners are able to test their knowledge of CPR using the manikin. Performance standards are based on the AMA's standards and guidelines for CPR. Without the assistance of a live instructor, learners are able to certify at both the Heartsaver and Basic Rescuer levels and receive the AHA Certification Card.

Arrhythmia Recognition

Using the same Learning System hardware, Actronics continues producing continuing education programs for the American Heart Association. The next program developed was *Arrhythmia Recognition*, the first in a series of videodiscs designed to teach the Advanced Cardiac Life Support course offered by the AHA.

The Arrhythmia program provides a complete learning experience in arrhythmia recognition based on the AHA's *Textbook of Advanced Cardiac Life Support*. The program is divided into background lessons, specific lessons on arrhythmia and ECG monitoring, and practice and test sessions in static and dynamic arrhythmias and therapeutic modalities.

Using the large storage capacity of the videodisc, a comprehensive set of ECG's with different versions of each arrhythmia is contained in the program. To insure comprehensive learning and retention, the *Arrhythmia Recognition* program combines ECG pattern and explicit medical drawings to highlight a multitude of arrhythmia variations. Refer-

ence Banks on drugs, algorithms, and arrhythmias are also available to the student at any time during the program.

Airway Management

The third program developed by Actronics, and the second in the ACLS series, is the *Airway Management* program. The purpose of the program is to provide education and training in airway management and airway adjuncts individually or within the context of an ACLS course.

After presenting a comprehensive course overview, the program contains individual lessons to examine the specific elements of airway management, from respiratory assessment to transtracheal catheter ventilation and cricothyrotomy. Learners have the opportunity to practice procedures and insertion techniques using an electronic intubation head, which senses correct placement and effective ventilations. Reference Banks include vocabulary and respiratory anatomy.

Megacode

The latest program released by Actronics is *Megacode*, which consists of three didactic lessons and an interactive video simulation. The lessons are titled "ACLS in Perspective," "Acute Myocardial Infarction," and "Putting It All Together."

When students enter the simulation portion of the course, they play the role of the team leader and are each given 25 minutes to treat a cardiac emergency. They are presented with a patient and are given a description of the patient's history, symptoms, and present condition. The student then begins to interact with his team members who appear on the video screen before him. *Megacode* actually requires students to speak to their team leader, asking for direction and responding to each decision the leader makes. The patient condition likewise responds to those decisions. At any time, random complications may present themselves for the student to recognize and correct.

Upon approval by the American Heart Association, students will be able to test and certify in Megacode using the simulation portion of the course. However, students also have the option to practice, rather than test, in the simulation. If a student chooses to practice, he is provided prompt remedial instruction for any error that is made. This feature allows students to gain practical experience and confidence before testing. Because of the random presentation of patients, problems, and other factors, each student receives a different variation of a cardiac emergency to treat. This prevents students from memorizing a scenario and allows for accurate, objective evaluation of each performance.

Circulatory Adjuncts and Resuscitation Pharmacology

The *Circulatory Adjuncts and Resuscitation Pharmacology* interactive video course has been developed in accordance with the standards and guidelines of the American Heart Association (AHA), and is approved for training and testing by the AHA's Emergency Cardiac Care Subcommittee. *Circulatory Adjuncts and Resuscitation Pharmacology* contains four core lessons and provides students with the opportunity to take the ACLS Written Post-Test in a computer-assisted format. *Electrical Therapy* presents information on how defibrillators work, and what factors increase or decrease the probability of successful conversion. It also discusses the energy requirements for both the adult

and pediatric patients, and provides demonstrations of techniques for defibrillation and urgent synchronized cardioversion. Recommendations for the care and maintenance of defibrillators are discussed, along with special situations such as defibrillating a patient with a permanent pacemaker. The Electrical Therapy lesson also contains an overview of emergency cardiac pacing, and instructions on how to deliver a precordial thump. *Intravenous Techniques* provides information on various types of IV cannulas and catheters, and discusses indications for establishing IV access. It also provides information regarding the common principles, advantages, disadvantages and complications of IV techniques. The peripheral and central techniques demonstrated in this lesson include the arm and leg, external jugular, femoral, internal jugular, and subclavian vein techniques. *Cardiovascular Pharmacology* discusses the medications commonly used during cardiac arrest, and those used to control cardiac arrhythmias. It also provides formation on pharmacotherapeutic objectives, and discusses the medications used to treat congestive heart failure, hypotension, hypertension, and cardiogenic shock. *Infants/Children and Special Situations* provides an overview and discusses the management of respiratory failure and shock. It also covers devices and techniques used to oxygenate and ventilate pediatric patients, as well as the treatment of life-threatening arrhythmias that may occur in these patients. Post-resuscitation management is also presented, along with information on accidental electrocution, near drowning and circulatory and pharmacological support.

Expanding Courseware Selection

Additional programs being developed by Actronics for the ACLS series include *Adjuncts*, *Pharmacology*, and *ACLS Test Disc.* However, in order to expand the selection of courseware available on their dedicated system, Actronics has begun adapting other commercial programs to play on the Learning System. Acquisitions include several programs originally produced by Health EduTech of Minneapolis, Minnesota. Titles include *Infection Control*, *Electrical Safety*, *Fire Safety*, *Back Safety*, *AIDS Information*, and *Sexually Transmitted Diseases.*

American Journal of Nursing

The American Journal of Nursing Company (AJN) is the largest nursing communications company, publishers of seven professional journals. The company also provides educational material for nurses and other health professionals through its Educational Services Division and Professional Seminars Division, including multi-media instruction, videotape distribution, inservice education via satellite, seminars and conferences, and a highly successful review course for students preparing for the nursing licensure examination.

The Elderly Patient with COPD

In the fall of 1988, the AJN released the first in a series of interactive videodiscs they are developing for nursing education. The first program is titled *The Elderly Patient with Chronic Obstructive Pulmonary Disease.* The content will focus on key clinical and decision-making skills. The AJN is now reviewing the final script for the disc, with video production beginning in April.

The program is being underwritten with a three-year Special Projects grant from the Nursing Education Branch, Division of Nursing, Public Health Service, Department of

Health and Human Services. A significant aspect of the grant is the fact that it not only provides for the *development* of interactive videodiscs, but allows for the *evaluation* of this newest advance in computer-based education, and for the *dissemination* of the results to the nursing community.

Nursing Care of the Elderly Patient

The second program released by AJN is *Nursing Care of Elderly Patients with Acute Cardiac Disorders*. The program is a Level Three interactive case study simulation about two patients: 1) a 73-year-old man who has a myocardial infarction is treated with thrombolytic therapy, then develops ventricular fibrillation requiring defibrillation, and 2) an 80-year-old man with congestive heart failure who develops atrial fibrillation and requires cardioversion.

Users manage the care of these patients by selecting from assessment and intervention screens as they progress through the case study. The choices on these screens are always the same, but the user must select only those which are appropriate at that point in the patient's care. Users have the opportunity to: request assessment data in order of importance, analyze ECG rhythms on a cardiac monitor and 12-lead ECG, interview the patient, regulate fluids and oxygen therapy, select appropriate medications, evaluate lab results, initiate emergency interventions, and set defibrillator for cardioversion and defibrillation.

Users can request information at any time from a library which is filled with information related to the program. They also can obtain definitions of terms by touching the word on the screen. An experienced nurse provides feedback and rationale for appropriate assessments and interventions, focusing on information about care of elderly cardiac patients. Learners are scored on their performance and compared to the score of an experienced practitioner.

Applied Interactive Technologies

Applied Interactive Technologies, Inc. (AIT) of Jackson, Mississippi has also developed and is marketing a proprietary videodisc hardware system which makes use of a cartridge rather than a floppy diskette. The Interactive Video Machine (IVM) sells for $1500 and consists of a modified Pioneer LD-V4200 videodisc player and a customized compact keyboard/microprocessor with operating system and control logic developed by AIT. A monitor and other peripherals are available at additional cost.

AIT has converted a number of existing videodisc programs to operate on both their IVM system and on InfoWindow-compatible systems. Each program sells for $750 and comes with a printed workbook and the necessary program cartridges. The programs include the following titles:

Converted from Health Edutech: AIDS Information Program, Sexually Transmitted Diseases, Health Hazards in Healthcare, Electrical Safety, Fire Safety, Back Safety, and Infection Control

Converted from the Children's Medical Services, Florida: Human Genetics for Nurses, Comprehensive Case Management of Spina Bifida, Case Management of Cleft Lip and Palate, Renal Analysis, Grieving Clients & Families, Intervention in Child Abuse and

Neglect, Pediatric Hematology, Pediatric Cardiovascular Defects, and Court Testimony and Documentation.

Converted from County College of Morris: Nursing Decisions for Postoperative Patients.

Converted from Bloomsburg University: Poison Prevention, Military Anti-Shock Trousers, and Crisis Management of the Ventilated Patient.

Converted from Alberta Vocational Centre: Urinary Catherization and Sterile Techniques at the Bedside.

Converted from Pitt County Memorial Hospital: Wound Care for Nurses.

Argosy Network Corporation

The Argosy Network Corporation was formed in 1987 as part of a new business development project for a major telecommunications manufacturing company. When the company later decided that the project did not fit with their primary mission, Kent Simpkins, a consultant to the project, secured the rights to the project, name, and logo. Simpkins incorporated Argosy in the State of Tennessee in August 1988.

Argosy plans to deploy a network of interactive video learning stations in hospitals throughout the United States. The Network will offer medical manufacturers and pharmaceutical companies an innovative media opportunity for product marketing, inservice training, and new product introductions by sponsoring courses on the Network.

On-line Interactive Network. The Network is built around a proprietary hardware system which will be installed in hospitals and fed via telephone lines from the Argosy office in Nashville. The delivery system consists of a computer, videodisc player, and touchscreen monitor. The videodiscs will be located in the hospitals, but because the control software is delivered on-line from Argosy, hospitals will pay a fee each time a course is used.

Users of the Argosy learning stations are presented with a menu of available courses. Using the touchscreen, they select the desired course. At appropriate points, the course will stop for query. Users can interact with the course and receive hands-on instruction and simulate real-world situations.

When a course is completed, the user's record is stored. The record may contain the user's name, date, time, responses to questions, score, or any comments the student may have about the manufacturer's product. The data is then collected by the Argosy computer network and reported back to the courseware sponsors and the user hospitals. This provides the essential feedback and record-keeping that is so important to the hospital, medical manufacturers, and pharmaceutical companies.

Argosy Network Corporation has begun to deploy the first phase of its network in 10 hospitals nationwide during a testing phase that will be completed at end of 1989. This phase will feature the following courseware: *Right Upper and Middle Lobectomy* developed by U.S. Surgical and Health Edutech programs *Back Safety*, *Electrical Safety*, and *Fire Safety*. Plans call for growth to 300 hospitals by the end of 1990 with a substantial increase in courseware from manufacturers and pharmaceutical companies.

Edudisc

Edudisc, Inc. of Nashville, Tennessee is marketing a number of interactive videodisc programs for the Macintosh computer. All of the programs were developed by Bloomsburg University using the Edudisc Mentor/MacVideo authoring software. The programs operate on Macintosh computers with Pioneer, Sony, and Panasonic videodisc players. All programs sell for $695.

Introduction to Case Studies in Hematology. A series of 20 case studies designed to acquaint users with basic problem-solving techniques involving cell identification and clinical correlations. It presents signs, symptoms, and laboratory data for users to explore the many levels of analysis involved.

Child Sexual Abuse. Illustrates the various physical signs of child abuse and presents a methodology for social workers and teachers to identify these problem signs and take steps to contact the proper authorities. Designed so that audiences who are either unaware of the physical indicators of child abuse or may need review can select the appropriate path best suited for them.

Stress Management. An individualized relaxation program for the viewer is determined through several questionnaires that indicate their current stress level. It then teaches them in a step-by-step manner how to let go of tension and relax their mind and body through the methods they select. The methods of relaxation are: breathing, visualization, yoga stretches, progressive relaxation, meditation, and autogenics.

AIDS Education. Addresses the many issues related to AIDS and sex education for teenagers. Consists of three parts: 1) Random access information bank consisting of AIDS information that teenagers should know; 2) Transfer and practice to assist viewers in relating information to real-life situations. Includes a simulation -based design that asks the viewer to make decisions based on their knowledge about AIDS and how it is introduced, acquired, and could be prevented. 3) Testing can either use a game show format or a standard test to evaluate viewer's understanding of the content. For Junior and Senior High School students.

Health Edutech, Inc.

Health Edutech, Inc. was formed in 1984 to develop educational, informational, and training programs using interactive video technology. A self-described electronic publisher, the primary audiences for Health Edutech programs are the healthcare and educational markets. Secondary audiences include state, county, and municipal governments; private industry, and correctional facilities.

With the funds from a public sale of 250,000 shares of stock at $2.00 each, Health Edutech was able to complete production and begin marketing *Hazards in the Workplace*, their first interactive videodisc training program. By April 1985, development costs for the program were recovered with sales to the Minnesota educational community who were complying with the Minnesota Employee Right to Know Act of 1983. Since then, Health Edutech has produced six Level II videodisc programs.

In 1988, Health EduTech, Inc. announced that a letter of intent for the sale of its health-related interactive videodisc courseware to Maxwell Communications Corp. of

Greenwich, Connecticut. The sale was be a $750,000 transaction with an additional $250,000 to be paid upon completion of specified government sales. The proposed sale failed to be consummated.

Infection Control

This Level II program is divided into chapters which cover a variety of topics designed to teach three employee groups: Nursing, Housekeeping, and Food Service. Some of the topics covered include Linen Handling, Handwashing/Personal Hygiene, Equipment Cleaning and Sanitization, Wound Care, and Handling of Waste.

Electrical Safety

This program teaches hospital employees about the electrical safety criteria designed by the Joint Commission for American Hospitals (JCAH) for health care facilities. Topics included in the program are Basic Terminology, Hospital Electrical Systems, Dangers, Patient Vicinity, Electrical Safety, and Emergency Procedures.

Fire Safety

Also designed around the criteria developed by the JCAH, topics in this program include What is Fire, Causes of Fire, Levels of Protection, In Case of Fire, Fighting a Fire, Evacuation Procedures, and Prevention.

Back Safety

Designed to teach proper lifting techniques, this program includes lessons on 1) the structure of the back, 2) the use of good body mechanics to prevent back injury, 3) basic principles of good body mechanics for lifting, pushing, reaching, and sitting, and 4) the proper way to perform trunk and back exercises.

AIDS

This program is divided into chapters covering what AIDS is, the diagnosis, transmission, prevention, symptoms, and complications of AIDS, and implication for life-style change. The lifestyle section is divided into two tracks: one for heterosexual audiences and one for homosexual audiences. Short quizzes are included at the end of each chapter.

Sexually Transmitted Diseases

This program begins with an overview regarding STDs and their impact on society, followed by detailed information about herpes, gonorrhea, syphilis, genital warts, vaginitis, viral hepatitis, chlmydia, and AIDS.

Image Premastering Services, Ltd.

The *Birth Disc* is a visual database of 9,000 color and black and white photographs illustrating childbirth. Developed by Artemis and Image Premastering Services, Ltd., this resource library documents the process of birth from pregnancy and labor, through birth itself to the emerging newborn and the postpartum experience.

Images on the disc capture physiologic and emotional details of such diverse prenatal concerns as prenatal care, labor support, vertex and posterior births in a variety of positions, breech, twins, forceps, cesarean and VBAC (vaginal birth after cesarean) births, newborn attachment and sibling/family interaction.

A table of contents and a cross reference index in this Level I videodisc assists user access to images. The comprehensive collection of birth images is presented in 65 chapters and 43 case studies captioned with concise, informative text. The products included in the sale are *Health Hazards in the Workplace, AIDS: An Educational Program, STD: Sexually Transmitted Diseases Information Program*, and the *Health Care Orientation Series.* The *Birth Disc* may be used to design individualized teaching and learning programs, to facilitate pre-clinical training for childbirth professionals, and to illustrate lectures, inservices and discussions.

Intelligent Images, Inc.

In January 1985, Intelligent Images, Inc. (III) began production on a series of patient simulations designed to provide continuing education to emergency medical personnel. Funded with venture capital, the project was the largest ever in the area of health-related videodisc production–with plans to produce 30 videodiscs at a rate of two each month. Six programs were completed, with several others in various stages of development, when funds were depleted and production was suspended in December 1985.

The series was written and produced under contract to III by the Human Resources Research Organization (HumRRO) in Alexandria, Virginia. The pilot program, *Shotgun Wound to the Abdomen* (Victor Mercedes), has received numerous awards, including "Best Educational Production" by the Nebraska Videodisc Design/Production Group as well as the Lesher Award for "best and most innovative educational communications" at the John Muir Medical Film Festival.

How the Programs Worked

The focus of the series is on the process of decision-making rather than clinical procedures. In each disc the learner must manage a patient by selecting from a series of menus which provide diagnostic and therapeutic procedures, monitors, X-rays, medications, lab tests, fluids, and consultants. The unique feature of these lessons--making them true simulations--is that the results of each decision will vary from moment to moment depending on the patient's status at the time of decision, the prior decisions of the learner, and the passage of real and simulated time.

Patient data such as vital signs, ECG's, X-ray, and lab test results change constantly and are dependent on treatment decisions. The computer keeps track of each decision and, at the conclusion of the lesson, provides feedback to the learner regarding key decision points as well as a cost-of-care analysis. Because some of the lessons are programmed with random complications, the learner may go through the same lesson several times without being able to predict the exact course the patient will take.

A Second Wind

When production was suspended, III released information stating that "initial sales efforts have shown that interactive videodiscs will become a well accepted training method

in the future, but that videodisc training is competing for hospital dollars normally associated with capital equipment acquisitions rather than training materials." The company temporarily shifted its focus and initiated "Test Market II" to clarify two areas of current concern: 1) the method of selling the interactive videodisc system as a training system rather than a capital expense and 2) the viability of additional topics within the marketplace that will broaden the market base.

In 1987, III merged with the R2 Corporation (medical supply) to form the DaRox Corporation. Currently, all of III's production and programming is being coordinated by their home office in San Diego, California. III managed to finish production on an additional two patient simulations, bringing the total to eight such programs on the market. The titles of the available programs are: *Abdominal Stab Wounds, Chest Trauma, A Patient With Diarrhea and Vomiting, Motor Vehicle Trauma, Diagnostic Decisions in Shock, Shotgun Wound to the Abdomen, Initial Assessment of Respiratory Difficulties,* and *Discontinuing Mechanical Ventilation.*

In addition, III has put together eight instructional programs to form the Nursing Assessment and Intervention Series. These programs are titled *Discontinuing Mechanical Ventilation*, *Pathophysiology of Cardiac Tamponade*, *Pathophysiology of Shock*, *Antishock Trousers*, *Central Venous Pressure*, *Chest Tubes*, *Auscultating Breath Sounds*, *IV Therapy*, and *IV Solutions*.

Current Sales Status

In the developmental years, III went through several hardware configurations, including the DEC IVIS and Sony View systems. They settled on the IBM InfoWindow system for all of their programs. Packaging and pricing has also varied, with the programs at one time available only in two packages: the Emergency/Critical Care Series of patient simulations costs $12,200 for the eight programs, and the Nursing Assessment and Intervention Series of programs sells for $5,500.

Sales of the systems has been slow, due to a number of factors relating to the technology and to the hospital environment. These problems are detailed in the chapter entitled Hospitals. In October 1987, David Allan, M.D., President of Intelligent Images, reported their programs were in approximately 20 medical schools, 20-plus community hospitals, six nursing schools, and several community colleges--for a total of about 50 systems. Although sales have continued since that time, placement has continued to be slow.

Infotronics, Inc.

In November 1987, Infotronics, Inc. of San Diego, California introduced a videodisc library for ophthalmologists. The programs were first introduced at the American Academy of Ophthalmology annual meeting and play on a proprietary Random Access Video Education (Raven) system which uses a Pioneer LD-V2000 videodisc player, color monitor, and custom-designed, programmable, hand-held remote-control unit.

A single-sided videodisc contains 28 short programs used for patient education in the doctor's waiting or examination rooms. The complete Raven system, including videodisc, costs $3,495 ($2,495 for additional systems). In the first six months, Infotronics sold more than 500 systems, making it the most widely distributed health-related videodisc program of the time. Following this success, Infotronics is planning three addi-

tional discs on ophthalmology and expects to enter into 10 additional medical specialty markets over the next two years.

Professional Training Systems

Professional Training Systems of Atlanta, Georgia recently entered the healthcare market in 1988 with four videodisc programs: *Understanding Aging, Care Basics for Nursing Assistants, On the Job Safeguards for AIDS,* and *An Ounce of Prevention*. Each program is part of the Pro-Vision interactive videodisc courseware series and will play on any major hardware system such as the IBM InfoWindow, Sony View, Visage, MCI, etc. Professional Training Systems also offers its own hardware configuration at a lower cost. The programs sell for $1500 and $1600 dollars each.

Understanding Aging

This program responds to the need for people to understand the process of aging. Designed for use by students, family members and friends of older persons, older persons themselves, people who work with older persons, and others who want to understand the aging process, the course takes a comprehensive look at the physical, mental, social, work, and financial changes that accompany aging.

Care Basics for Nursing Assistants

This introductory course meets the training needs of nursing assistants working in long-term care environments, and examines the complex needs of residents in long-term care. The program deals with human relations and communications, legal and ethical issues, the importance of accurate observation, reporting and recording, how to control infection and fire safety, and accident prevention.

On the Job Safeguards for AIDS

This program is designed to meet the training and educational requirements specified by the Occupational Safety and Health Administration (OSHA) for healthcare employers. It deals with precautions which can be taken by healthcare workers and other workers to prevent exposure to human immune deficiency virus (HIV), commonly known as the AIDS virus, and other blood-borne diseases such as hepatitis B virus (HBV). The course includes an overview of the AIDS virus, modes of transmission, universal precautions, precautions for specific workers, and future developments with the AIDS virus.

An Ounce of Prevention

Developed for use by child care professionals, this course offers comprehensive training on recognition, reporting, and prevention of child abuse. Topics covered include the magnitude of the child abuse and neglect problem, reporting requirements, and prevention.

ProCare: Nurse Assistant Training

Professional Training Systems has joined forces with the American Health Care Association (AHCA) in Washington, DC and the Educational Testing Service (ETS) of Princeton, New Jersey, to develop and market 80 to 120 hours of videodisc instruction to

train and evaluate Nurse Assistants. The curriculum is based on the AHCA's *How to be a Nurse Assistant Instructor* and *Student Manuals*. The programs are designed to meet the 75 hours of training mandated by the federal government for all Medicare and Medicaid certified nursing homes.

At least 16 new interactive videodiscs are to be developed by PTS. Course components will include the important core subject areas: basic patient care, residents's rights, food and nutrition, personal care, accident prevention, resident assessment, infection control, the residents' environment, speech and understanding, responsibilities of a nurse assistant, and the healthcare team. The ProCare series is designed to run on the PTS PV-145 hardware system, which consists of a proprietary controller/keypad interface with a Pioneer videodisc player.

Scholastech Limited

Scholastech Limited of London, England has launched an ambitious videodisc series on human anatomy titled *The Anatomy Project*. When completed, the series will contain 24 disc sides in six general areas: Neuroanatomy (2 disc sides), The Upper Limb (4), The Head and Neck (6), The Abdomen and Pelvis (4), The Lower Limb (4), and The Thorax (4).

The material on each disc will include original linear and still-frame sequences as well as references for self-assessment, cross-referencing, and a glossary. In addition, each disc will be programed for six separate audiences: Medicine, Dentistry, Nursing, Radiography, Physiotherapy, and Post-Graduate. Each audience group will be led through the discs using a different path matched to their area of interest.

The Anatomy Project discs are designed for use on Level One, Two, or Three videodisc systems. The images may be used without programming (Level One) by students or teachers, who are guided through the images by an accompanying workbook.

The series is also programmed for Level Two operation, and can be played on the Pioneer LD-V6000A series videodisc players or the new Pioneer LD-V8000 videodisc player. Level Two players incorporate an internal microprocessor which allows the program code to be loaded from the videodisc. The code is loaded automatically into the microprocessor and the system is operated by a hand-held remote.

The Anatomy Project also is offered as a Level Three software package in which the videodisc player is controlled by external computer. Software is available for both Info-Window-compatible systems and two-screen IBM PC-compatible systems. Software for two-screen Macintosh systems is being developed.

How the Program Works. When the program is started, a short introductory sequence plays, leading the user into the First Menu of options. At this stage a user level (later also a language) and chapter is selected. By pressing play, the user chooses the default mode and Chapter One is played at the most detailed viewer level (Postgraduate).

Once a valid chapter is entered, the program takes a few seconds to load the programming for that chapter, which includes information on the video sequences, text and pictorial image frames which summarize and revise the chapter content, and a set of self-testing questions. These are organized by viewer level. There is also a Glossary which can be viewed at any time by pressing the AUTO STOP key.

The First Menu, which can be accessed at any time by pressing the left SCAN key, offers a choice of chapters and two subsidiary menus. After a choice is made from one of the other menus, the Main Menu returns to enable users to select the chapter of their choice. The course level menu enables the user level to be selected or varied using a single numerical keystroke.

The first two discs in the series, *The Eye*, and *The Hand and Wrist* have been completed, with two discs on Neuroanatomy due in April 1990. Each disc sells for $1,650, with an additional charge of $250 for Level Three software. A Launch Offer is in effect for the first part of 1990 where, for each disc purchased, a second copy will be provided free of charge. This "two-for-one" offer will apply to all subsequent discs in the series as long as they are purchased in sequence. In addition, the original launch price will be guaranteed for all 24 discs in the series.

The Anatomy Project

NEUROANATOMY

Disc 1: General neural organization—peripheral and central systems; Brief cytology, synapses and transmitters; Major divisions of the CNS; The forebrain and midbrain.
Disc 2: The hindbrain, the cranial nerves; The spinal cord, the spinal nerves; The cranial cavity, blood supply and the meninges.

THE UPPER LIMB

Disc 1: General topography and anatomy of function.
Disc 2: The hand.
Disc 3: The forearm and elbow.
Disc 4: The upper arm and shoulder.

THE HEAD AND NECK

Disc 1: General introduction to function and topography; The bones and joints of the head and neck.
Disc 2: The teeth.
Disc 3: The nose, paranasal sinuses, mouth, pharynx, larynx.
Disc 4: The face and scalp.
Disc 5: The ear, preauricular region, infratemporal fossa and pterygo-palatine fossa.
Disc 6: The neck, its triangles, suprahyoid and vertebral regions, root of the neck.

THE ABDOMEN AND PELVIS

Disc 1: The abdominal wall and the back—the bones, joints, muscles, and the blood and nerve supply.
Disc 2: The abdominal cavity—general introduction and topography; The alimentary canal, pancreas and spleen, the peritoneum.
Disc 3: The kidneys, ureters, and bladder; The vessels and nerves of the abdomen.
Disc 4: The reproductive system.

THE LOWER LIMB

Disc 1: General introduction and topography; The anatomy of function—locomotion and posture.
Disc 2: The foot and ankle.
Disc 3: The lower leg and knee.
Disc 4: The thigh and hip.

THE THORAX

Disc 1: The thoracic wall—its bones, joints, muscles, and skin; The diaphragm, intercostal spaces and the breast.
Disc 2: The mediastinum—general introduction and topography; The heart.
Disc 3: The great vessels—the aorta, the vena cavae; The pulmonary vessels; The blood, lymphatic, and nerve supply of the thoracic cavity.
Disc 4: The pleural cavity—the lungs and pleura.

The Training Group

Another 1988 entry into the commercial videodisc market is The Training Group, based in Edmonton, Alberta, Canada. They are marketing a series of 12 Cardiology videodisc programs as well as one each in Emergency Medicine, Mega-Code, and Obstetrics. The programs range in price from $1,000 to $1,995, and will play on the IBM Info-Window as well as other systems.

Cardiology Courseware

The lessons in this series were developed for use by undergraduate medical students as part of their course on instruction prior to seeing and examining patients on the wards or in the outpatient department. They are designed to provide a means for the students to work out the effects of individual heart lesions and then predict the physical findings and important symptoms likely to result. Remedial material is available at each point in the lesson. By the end of each program, the students will have worked out the physical signs, symptoms, and the results of simple investigations required when faced with such clinical problems in practice. The heart sounds and murmurs are presented from a videodisc when the student touches the simulated "body" on the screen.

The Cardiology series consists of the following titles:

- The First and Second Heart Sounds
- Heart Murmurs and Other Sounds
- The Normal Electrocardiogram
- The Abnormal Electrocardiogram
- Mitral Stenosis
- Mitral Incompetence
- Aortic Stenosis
- Aortic Incompetence
- Atrial Septal Defect
- Ventrical Septal Defect
- Pulmonary Stenosis
- Patent Ductus Arteriosus

Emergency

This "real time" emergency simulation of a motor vehicle accident takes place on the street. It focuses on the procedures required to stabilize a trauma patient prior to

transport to a medical facility. The decisions are monitored and student performance is displayed at the end of the simulation.

Dysrhythmia Training and Evaluation

This program simulates arrhythmia. Students can select options that provide the following: 1) a review of basic electrocardiography, 2) arrhythmia recognition, 3) patient simulations, and 4) a performance printout. Instructors have additional options that allow a pre-programming of patient simulation parameters, administration of final exams, and student performance printouts.

Obstetrics

This is a "static time" simulation of the delivery of a baby in a rural community hospital The decisions made by the students are monitored and their performance is displayed at the end of the simulation.

Chapter 5

Testing & Certification

Although little use is being made of videodisc systems for testing and certification, the potential of the technology for such purposes is tremendous. With the ability of videodisc systems to simulate medical situations, they not only are ideal for training and education but for assessment as well. The most significant development in this area is taking place at the National Board of Medical Examiners in Philadelphia, where a computer and videodisc component may soon be added to the examination leading to licensure for U.S. and Canadian medical school graduates. After this system is successfully implemented, many other certifying and licensing organizations are sure to follow suit.

National Board of Medical Examiners

The National Board of Medical Examiners (NBME) has incorporated videodisc technology into its Computer-Based Examination (CBX), a new examination tool being developed for future use by the NBME. CBX is an interactive clinical simulation developed by the NBME that will be administered using regional evaluation and learning centers equipped with networked microcomputers and videodisc players.

CBX represents the result of the NBME's 18-year research effort to develop clinical simulations to evaluate physician competence. The current CBX model emphasizes patient management and dynamically responds to the movement of time. Field trials of CBX have demonstrated its validity and reliability in the assessment of physician competence.

The CBX will be used as a major component of the final NBME examination leading to certification and licensure for approximately 13,000 U.S. and Canadian medical school graduates each year. This use represents a major advance in assessment of clinical competence, adding a new dimension to the elements of competence objectively evaluated. The NBME expects that computer-based testing will also be used widely in other licensing and certifying examinations, as well as in self-assessment programs.

The widespread application of simulation technology in the evaluation of physician competence is likely to have several beneficial effects. First, the use of simulation in medical education will be encouraged by the use of simulation in the evaluation process. Second, observation of clinical performance in standardized clinical situations will be possible for large numbers of individuals for the first time. Third, the ability to assess physician competence will be greatly enhanced. Finally, availability of a computer-based delivery system for CBX will encourage the development and use of other innovative computer-based methods in the evaluation of physician competence.

NBME Plans for Computer-Based Testing

In 1987, the NBME conducted a major field study of the CBX system and, as a result, has "further clarified the measurement characteristics and confirmed the value of computerized patient simulations in the assessment of clinical competence." The NBME is now making the CBX program available to selected medical schools for further evaluation. Applications have been solicited from schools, and will be selected on the basis of their program description, willingness to provide appropriate support for the CBX system, and payment of a license fee of $1000.

The selection of schools for further use and testing of the CBX was the first of four phases designed to bring the program to the point where it can be implemented in the NBME examinations. During Phase One, the NBME provided participating schools with copies of the CBX program, orientation material, computerized feedback questionnaires to obtain user feedback after a CBX session, and continued technical support through the use of a direct telephone line to the NBME.

The second phase began in late 1988 when subject tests were offered to participating schools. These subject tests, consisting of selected CBX cases and multiple choice questions (MCQs) for clinical disciplines, will be made available for further study and will be administered only at participating schools. Additionally, some schools were selected as prototypes for future authorized testing centers.

Phase Three began in 1989 when fully-developed tests were offered to participating institutions for intramural evaluation. Schools were selected for designation as authorized testing centers. In Phase Four the CBX will be implemented in NBME examinations using authorized testing centers.

CBX Today

The CBX consists of patient simulations which are presented in an uncued patient management environment. The student is presented with a brief description about the condition, circumstances, and chief complaint of the simulated patient. Subsequent information about the patient depends on the student's requests for tests, procedures and/or therapies. The student is expected to diagnose and manage treatment and to monitor the patient's condition as it changes over time and in response to treatment. Over 2,000 diagnostic and therapeutic actions are possible, which the student requests by typing in orders on the computer keyboard. The results of some tests are provided using medical images from a linked videodisc.

The computer maintains a record of every action requested by the student. This record is then compared to a scoring key, which consists of actions that a committee of experts identifies as being beneficial or harmful (risks) to the patient. For initial use in medical schools, cases have been modified to compare student actions with scoring key actions at the end of each case.

There are five sets of five cases each available, and one set of eight multidisciplinary cases. The case subjects include Pediatrics, Internal Medicine, Surgery, OB/GYN, and Family Practice.

CBX Pilot Test Results

CBX was recently evaluated in a large pilot test involving 200 residents and 75 students in Chicago and Philadelphia. Each learner was administered seven cases and 140 multiple choice questions over two full days of testing. The test results were compared with MCAT scores, NBME Part I, Part II, and Part II scores, the 1987 Part III PMP (patient management problems) scores, and the rank ordering of program directors. The results were reviewed by an independent advisory panel (comments found in Chapter 16, Videodisc Research/Surveys).

Based on currently available evidence, the NBME feels the CBX is a testing method that meets both psychometric and logistic criteria for use in large-scale testing programs. Therefore, they feel it is likely that the method will prove useful in assessing competence of physicians. While several important questions have not yet been fully answered, information from the pilot testing has allowed the NBME to make the following conclusions:

Prior Computer Experience. Neither prior computer experience nor computer anxiety influences examination performance for residents. Using a survey to quantify prior exposure to and experience with typewriter keyboards and computers, a computer experience score was developed for each student and resident. Using the Computer Anxiety Index, pretest anxiety state was assessed. State of anxiety was also assessed utilizing adjective checklists. These subject characteristics were compared with performance on the CBX portion of the pilot exam. These analyses showed that residents' test performance was uncorrelated with computer experience (0.09), computer anxiety (-0.07), and the level of pretest anxiety (-0.04). In the smaller student group, the correlation between CBX performance and computer experience was higher (0.27), approaching significance at the 0.01 probability level. The explanation for this apparent difference between the student group and the resident group needs further exploration.

Standardized Test Conditions. Test conditions need not be standardized. The pilot examination was conducted at two sites. In Philadelphia, a carefully controlled testing center optimizing ergonomics of the examination environment was utilized. In Chicago, a temporary facility was constructed with little attention to ergonomic details. Chicago and Philadelphia residents did not differ in ability, nor did the difficulty of the scoring elements vary between the two locations.

Practice with CBX. Considerable practice opportunity must be provided before use of CBX for testing. Two forms of the CBX portion of the examination were given to random halves of the pilot exam sample. The first and last two cases were interchanged on the two forms. Comparison of performance on the simulation that differ only in their position in the examination allowed an assessment of learning effect on examination performance. Three of the four cases and their individual elements were more difficult for examinees when they were positioned early in the exam. While the amount of practice effect seems to be somewhat determined by the nature of the simulations encountered early in the exam, it is clear that experience with four or five simulations is required before performance will stabilize. In surveys of pilot exam participants, only 13 percent of examinees were comfortable with the mechanics of the CBX model after the orientation and practice case, while 72 percent were comfortable after the second case and nearly all were comfortable after four or five cases.

CBX Reliability. While CBX precision of measurement is equal to that of patient management problems (PMPs) when time is held constant, a single day of testing will not be adequate to reliably assess all examinees. Using eight CBX cases, required six hours of testing time, an alpha reliability of 0.75 was attained. In combining eight CBX cases with 280 multiple choice questions (the current Part III MCQ length), the expected reliability of a linear combination would be 0.82. In assessing performance of the instrument in the pass/fail range, the standard error of measurement (SEM) for residents straddling the fifth percentile was 0.50 standard deviations. While this data suggests that a two-day examination would be required to reach a combined reliability of 0.9, alternate strategies that might reduce this time include better targeting of the simulation and sequential testing, administering larger numbers of cases only to those examinees whose performance falls at the bottom of the distribution on a screening set of cases.

CBX measures something different from PMPs and multiple choice questions (MCQs). Analyses of correlations, factor analyses, regression analyses and "pass/fail" analyses all confirmed a difference between what is measured by CBX and other methods. PMP and CBX correlated 0.33 with each other. When PMP risk and benefit scores were combined to maximize their relationship with CBX, the correlation increased to only 0.34. When corrected for attenuation, these correlations are approximately 0.56. MCQ and CBX correlated 0.37 with each other. When corrected for attenuation, this correlation is 0.49. A factor analysis of MCAT, Part I MCQ, Part II MCQ, Part III, CBX and PMP scored produced three factors: Part I/Part II, MCAT and Part III. CBX did not fit in easily with any of the three factors, but has its highest loading with the Part III factor. Interestingly, CBX loaded more highly with the Part I/Part II factor than did PMP. In this analysis, the three factors which emerged explained 22 percent of the variance in CBX and 51 percent of the variance in PMP. Finally, when a theoretical pass/fail line is drawn at the fifth percentile of each group, there is substantial disagreement between CBX and PMP in classification of differences in the trait being measured or to the inherent imprecision of both measures.

Resident Specialty. There is no consistent effect of resident specialty on CBX performance. It has been shown that there is a strong specialty effect on MCQ items in Part III and a weaker specialty effect on PMPs. In CBX, two of the cases in the pilot exam showed noticeable specialty effect. Other cases, including cases in the same specialties as those with demonstrated specialty effect, showed no difference. More study is needed to determine the characteristics of a case that result in a specialty effect.

Computerization of MCQ Items. Computerization does not affect difficulty of MCQ items. Difficulty of items presented by computer did not vary from the difficulty of the same items when presented in the written Part III examination. Computer administered MCQs were answered more quickly than written MCQs, and residents expressed a marked preference for administration of MCQs by computer.

Computerization versus Written Testing. Residents and students prefer computer administered examinations to written examinations. In questionnaires administered at the end of the examination, residents preferred computer-based simulation to written simulation by a 3:1 margin, and students preferred computer administered simulations by a 9:1 margin. In expressing preference for administration of the NBME Part III examination, residents preferred computer administration by a 2.4:1 margin, and students by a 7:1

margin. Residents found CBX to be as fair a measure of clinical knowledge as MCQs. Residents preferred computerized patient simulations to written simulations or MCQs as valid assessments of overall clinical competence. Students have similar preferences, but more strongly in favor of computer administered tests.

CBX Field Testing.

The National Board of Medical Examiners has begun testing their new Computer-Based Examination (CBX) at 70 medical schools nationwide. The exam includes multiple choice questions identical to those currently administered in the Part I, II, and III paper-based exams. In addition, the CBX includes an open-ended videodisc-based simulation that is designed to provide an uncued test of patient management skills.

Each participating school or test site was required to purchase three delivery systems, each consisting of an IBM-PC XT or equivalent, and either a Pioneer LD-V6000 series, Sony LDP-1200, or LDP-1500 videodisc player. The videodisc simulation portion uses a two-screen presentation method which eliminates the need for video overlay and keeps the cost per system at about $2,500.

While the entire CBX is still in a research phase to evaluate its effectiveness, the multiple choice part will be certified soon as a standard part of the exam process. The simulation will require additional research to determine the validity of scores for the open-ended procedure.

During 1988, 16,703 people took the part I exam, while parts II and III each were taken by more than 13,000. Stephen Clyman (CBX project director) sees the potential for multiple systems to be installed at each of the 144 medical schools in the US and Canada, with at least two sites per state.

Feedback from Test Sites. The NBME has collected and released summary evaluations provided by 23 of the CBX testing sites. A review of some of these results is provided in the chapter entitled Videodisc Research/Surveys.

National Council of State Boards of Nursing

The National Council of State Boards of Nursing (NCSBN) is working with the National Board of Medical Examiners (NBME) to develop simulations to test decision-making skills of candidates taking the National Council Licensing Examination (NCLEX). The Clinical Simulation Testing (CST) model, being developed with a $1.86 million grant from the W.K. Kellogg Foundation, will use the same design as the NBME's Computer-based Training model to evaluate nursing decisions related to assessment and interventions.

The CST model is not being developed to ask the candidate how to do a procedure or how to implement nursing care, but rather to evaluate the decision to give care. The decisions to be evaluated relate to assessment and intervention. The candidate will be presented with patient data and will be asked to make decisions regarding the patient using a free-entry system designed to be non-cueing.

During the course of the simulation, candidates will be able to gather information on the patient from four sources: 1) "patient" interviews, 2) physical examination of the patient, 3) existing documents such as the patient record, and 4) interviews with the patient's family, friends, or other health professionals. Intervention will be selected using

a menu which includes verbs such as administer, monitor, perform, omit, continue, and counsel. After selecting a menu item, the candidates enter what it is they want to do in relation to the verb that they have selected.

The simulation will use a free-entry input where the users will type their requests into the computer using English language words (e.g. "monitor blood pressure"). Unlike menu-driven simulations where users must pick from a list of pre-selected options, natural language text entry allows users more flexibility to make their own choices regarding assessment and intervention. However, according to Carolyn Yocum, principal investigator, one of the major obstacles using this approach is the lack of standardization in nursing terminology. In order for this system to work, a lexicon must be developed for the computer that will recognize entries made by candidates from different environments. In other words, the developers must anticipate all of the possible terms that will be used by these candidates.

Chapter 6

Videodisc Research/Surveys

Videodisc Effectiveness—CPR Learning System

The CPR Learning System marketed by Actronics, Inc. has been the focus of much research because it provides the identical information that is presented in a CPR classroom environment. This makes it easy to compare the videodisc training with classroom, or live instructor training. The following is a summary of a few of the available reports.

Effectiveness of Interactive Video to Teach CPR Theory and Skills (1984)

This study was initiated in response to a request by the American Heart Association to compare the effectiveness of an interactive video system of CPR instruction versus traditional instruction. Two comparison groups of 50 students each were used as control and experimental groups. Most of the population consisted of nursing students between 18 and 20 years old. Evaluation was to be performed by former CPR instructors who were to test students from either group without knowing their mode of instruction.

The results showed no significant difference between interactive video instruction and traditional instruction in both skills and knowledge, with the exception of one area: the interactive video system taught skills for obstructed airway in the adult significantly better. During this study, it took approximately six to eight hours for basic life support in both groups including certification. The study concluded that a technological means of instruction such as interactive video can be a valuable adjunct in helping to meet present demands for CPR courses. *(Ann L. Lyness, School of Nursing, University of Pittsburgh)*

An Examination of the Use of Interactive Videodisc Cardiopulmonary Resuscitation Instruction for the Lay Community (1985)

At the time this study was done there were no other studies reported investigating the use of the Actronics CPR Learning System with the lay public. Studies undertaken in the design phase of the system had included only health professionals. Therefore, the purpose of this study was to examine the efficacy of the CPR Learning System for community CPR instruction at both the Heartsaver and BCLS levels.

An experimental group was taught CPR through the interactive videodisc system while a control group was taught by the traditional classroom method. The population was 65 employees of a major oil company. All groups were tested immediately following instruction and then retested at three months and one year. To determine performance

skills, each subject was asked to provide an "examination" tape within the allotted training time (subjects were not allowed to return with a tape at a later date). Those subjects in the control group produced a traditional tape from the manikin on which they trained. Subjects in the experimental group recorded their "examination" tape on the system's computer.

Results and Summary. Overall, there were no significant differences between the control group (traditional CPR instruction) and the experimental group (CPR Learning System) along the dimensions of initial skills performance, initial cognitive knowledge score, three-month skills retention, three-month cognitive knowledge retention, one year skills retention, and one year cognitive knowledge retention. Although a study based on a population of 65 is limited in many ways, it can be postulated that the CPR learning system is at least as effective as traditional CPR instruction. A continuation study was to be conducted using a population of more than 400 people. Results from that study may provide more conclusive information. *(Margaret J.A. Edwards, R.N., M.A. and Kathryn J. Hannah, R.N., Ph.D., Faculty of Nursing, The University of Calgary)*

Effectiveness of an Interactive Video Approach for CPR Recertification of Registered Nurses (1986)

The purpose of this 1986 study was to validate a specific interactive video teaching method for CPR recertification of Registered Nurses. The few studies that have been conducted to validate the use of an interactive teaching method to teach CPR have been limited to lay subjects or nursing students learning CPR for the first time.

The quasi experimental design randomized 57 Registered Nurses into interactive video or traditional lecture/demonstration teaching groups by their clinical work area (acute care vs. non acute care units). American Heart Association content and testing materials were used. Knowledge test scores and skill test scores were analyzed using ANOVA and Pearson Product Moment Correlation statistical methods.

Summary of Results. There was no significant difference found in knowledge or skill test scores between participants of the two teaching methods or between participants from different work areas. In addition, there was no correlation found between the number of CPR experiences a subject witnessed or performed in the clinical setting with knowledge or skill performance scores. Nurses who experienced the interactive teaching method preferred the interactive video method two to one. Instructor time was reduced 87 percent and participant time was reduced 11 percent on the interactive systems to learn the same content equally well. *(Doctoral Dissertation by Mary Elizabeth Aukerman, R.N., Ph.D., University of Pittsburgh. Sponsored by the Shadyside Hospital, Division of Nursing, Pittsburgh, Pennsylvania)*

Evaluation and Attitude Survey of the Actronics CPR Learning System (1986)

As part of the requirements to fulfill a New Jersey Department of Higher Education Computers in Curricula grant on *Improved Teaching of Cardiopulmonary Resuscitation*, the County College of Morris (CCM) conducted an evaluation and attitude survey among students who completed the college's CPR instruction program on the Actronics Learning System.

The survey was developed using a "forced choice" response method where students were asked to strongly agree, agree, disagree, or strongly disagree to each of 31 statements evaluating their use of the CPR system. There was no neutral response permitted on the survey form. An additional ten questions asked for a "yes" or "no" answer. Student comments were solicited on the form as well. A total of 87 surveys were mailed, with 31 returned (35.6 percent).

General Summary and Conclusions. The general trend of student responses indicated very positive attitudes about computer-based instruction. With very few exceptions, students were receptive to this type of instruction, noting that the most valuable aspect of this instruction was the ability to learn at one's own pace (100%). More than half of the students felt that the Actronics system was like "real people" teaching CPR (64.6%), 90.3 percent liked practicing CPR without a human instructor watching, and 80.7 percent enjoyed working alone.

Another very positive result of this instructional program is indicated by the students' willingness to recommend the interactive CPR course to other students (96.8%), and their willingness to take another interactive-based course if one were available in an area of interest (90.3%).

Student receptivity to the interactive CPR instruction program was high, with 96.8 percent indicating that they enjoyed using the system. Although 19.1 percent said they were frustrated by the system at first, the percentage dropped to 9.7 percent frustration at the end of the course.

There was a significant time savings for the students, with the average time to achieve Basic Rescuer certification being 7.56 hours (compared with 12 to 15 hours in a regular CPR class). A look at overall student records and testing results reveals a high level of mastery of the subject matter with 97.7 percent of all students completing certification in CPR on the system. This compares favorably with a traditional CPR class passing rate of approximately 80 percent.

Other Videodisc Effectiveness Studies

Full-Scale Pilot Testing of Florida's Videodisc Training Project (1984)

Florida's Department of Health and Rehabilitative Services decided in 1979 to train certain of its newly hired workers (approximately 500 annually) with a microcomputer-driven interactive videodisc program. Pilot testing of the 160-hour training program proved an average reduction in training time (over traditional delivery) of 25 percent. Upon taking a final exam following completion of the course, more trainees receiving the videodisc training passed the test (66%) than did trainees in the conventional program (50%). In general, trainees indicated a preference for computer-based instruction over traditional classroom instruction. (Smith, Richard C., *Full-Scale Pilot Testing of Florida's Videodisc Training Project*, Office of Interactive Technology and Training, The University of West Florida, Pensacola, Florida 32514)

University of Texas-Houston (1985)

A comparison of noninteractive and interactive video instruction about smokeless tobacco was conducted at the University of Houston, the results of which will be published

soon. After viewing a linear or interactive version of a videotape, experimental and control groups completed a questionnaire to ascertain knowledge and attitudes about smokeless tobacco and lesson satisfaction. The interactive video group demonstrated the most accurate and comprehensive recall. Additionally, the interactive video group was more willing to promote cessation among users. Learner satisfaction with the interactive video equipment and lesson was high. For additional information, contact Dr. Phyllis Levenson, Department of HPER, College of Education, University of Houston, Houston, TX 77004, 713/749-4386 or 713/721-4134.

Instructional Effectiveness of an Intelligent Videodisc in Biology (1984)

WICAT Systems, Inc. produced a "proof-of-concept" instructional videodisc in college biology with support from the National Science Foundation. Student learning with videodisc instruction was compared to traditional lecture learning in introductory biology courses at three different colleges. Videodisc students consistently displayed greater learning and retention gains, reduced study times, and higher productivity ratios. These findings were in agreement with the extensive literature on individualized instruction, both with respect to learning gains and time savings. Increased student confidence is also commonly reported in autotutorial courses. The values of imagery and experiential learning (direct and vicarious) are also widely touted, although less documented by hard data. (Bunderson, C.V., Baillio, B., Olsen, J.B., Lipson, J.I., Fisher, K.M., *Interactive Effectiveness of an Intelligent Videodisc in Biology*, Machine-Mediated Learning, V.1, No. 2, 1984.

Chemistry Videodisc (1986)

The Chemistry Department of the University of Illinois, through a grant from IBM, has developed Project EXCEL, a system of interactive videodisc and PC work stations to teach basic chemistry to incoming students. They have 16 work stations available 14 hours a day. The stations were Beta-tested in the spring session by students who had not taken any chemistry courses in high school. Test results showed a higher understanding of the material by those students who used the disc systems as opposed to those who only had lab experience.

The Evaluation of Science Lab Videodiscs (1984)

Educators at the University of California in Berkeley compared use of videodiscs simulating science laboratory experiments with actual laboratory experience. The videodiscs used were produced by the University of Nebraska with a grant from the Annenberg/CPB Project. The subjects covered by the programs were physics, chemistry, and biology. The researchers found that students using videodisc typically work through an experiment more quickly than those in a conventional lab setting, due primarily to the "instant" results available with the videodisc program. The videodisc simulation also enabled students to examine a wider variety of conditions than is possible in a traditional lab.

Observations revealed that students using the videodisc appeared less confused about what to do than students in the traditional lab, who frequently checked with the Teaching Assistant to make sure the experiment was being conducted accurately. It was also found that the videodisc students exhibited more task-oriented behavior and self-suffi-

ciency. Videodisc students performed as well or better than their lab counterparts when given tests following the lab experience. (Paper presented at Fifth Annual Nebraska Videodisc Symposium, August 1984 by Barbara Gross Davis, University of California, Berkeley, CA 94720)

GM's Hazardous Materials Training

Hazard communication training at GM

In 1985, the UAW-GM National Joint Committee on Health and Safety appointed a task force to develop a hazardous materials training program for GM employees. The result of their efforts was the UAW-GM Hazard Communication Training Program. There are nine modules in the interactive video training program that address various types of hazardous materials handled by GM workers. A second version of the training using video tape was also produced. This version has the same nine modules as the interactive video. It also has a comprehensive trainer's guide for conducting an effective classroom training program.

The Evaluation. It was decided that, following completion of the development of the Hazard Communication Training Program, an in-house evaluation would be conducted as well. Two-hundred and nine workers from 15 GM plants in the Midwest participated in the evaluation. They came to the UAW-GM Human Resource Center in Madison Heights where the evaluation was conducted.

The module on solvents was used for the evaluation. Participants who had not had training on this module were used. Training was done using the Interactive Laser Disc System and a "best case" classroom training involving an expert trainer who followed carefully developed procedures. The amount of learning of the content of the training and of attitudes were tested.

Results. The results of the evaluation showed positive results for the interactive laser disc training. When the Interactive Laser Disc Training was compared with a "best case" classroom training, the Interactive Laser Disc Training produced more learning. The average scores on the 16-point test were: laser disc group = 13 (81%); classroom group = 10 (63%). The ILDS group scored 26% better than the classroom group. The workers who did the best and worst on the test were compared. Most of the workers who did the best (high achievers) had been trained on the Interactive Laser Disc System. Most who did the poorest (low achievers) had been trained in the classroom instruction.

Attitude Toward Interactive Training. In the comparison of the two training methods, attitudes about the Interactive Laser Disc training were the most positive. Eighty percent of the workers preferred the Interactive Laser Disc training to the classroom. Seventy percent felt it was easier to pay attention to the Interactive Laser Disc training. Seventy-eight percent felt they learned more from Interactive Laser Disc training. Ninety-eight percent felt it was easy to use the Interactive Laser Disc System.

All workers performed equally well on the Interactive Laser Disc System. Age, sex, amount of education, and years of employment at GM did not limit their success in training. In addition, attitudes toward the System were not affected by any of these factors. The attitudes were highly positive in all groups.

The average time to complete the ILDS instruction was 33.87 minutes/student. The average time to complete the classroom instruction was 33.25 minutes/student. The difference in training time was minimal.

Conclusion. The evaluation showed that the Interactive Laser Disc System was very effective in achieving training objectives, strongly preferred by workers, and competitive with the classroom method in the amount of time taken to complete the training.

National Board of Medical Examiners—Computer-based Testing Program (1987)

The computer-based simulation test (CBX) developed by the National Board of Medical Examiners was evaluated in a large pilot test. Results of this pilot test were reviewed by an independent advisory panel which concluded the following, which is quoted from the Interim Report of the Computer-Based Testing Advisory Panel, September 15, 1987:

- CBX succeeded in measuring a quality not measured by multiple-choice questions (MCQ) or written patient management problems (PMP) that may reasonably be considered to be related to "general clinical competence." Scores tended to be consistent across varied cases; only a few cases were clearly easier for the residents in the "matching" clinical specialty.
- The procedures for developing cases and scoring keys have progressed to the point of being clinically and psychometrically acceptable. They are now practical for an operational test, though there is much room for improvement. . . Although general computer experience as such had no influence on scores, CBX showed a strong practice effect in the pilot study. This and other evidence implied the need for extended examinee familiarization prior to taking the test.
- Precision of measurement at the low end of the scale is a major concern. . . With present cases and scoring methods, CBX and PMP have about equal precision when the testing time is held constant. However, the error of measurement is large. Changes in length and difficulty of cases and in decision rules, including sequential and/or adaptive testing, have been suggested for trial. It is hoped that these will permit a one-day computer-based test for all but borderline candidates.
- The Computer-based Testing Advisory Panel has reviewed the status of the NBME CBT project following pilot studies on medical students and residents and is impressed by the progress that has been made. Now, for the first time, software and cases are ready for dissemination beyond settings controlled by NBME. On the other hand, we conclude that CBT should be used for certification and licensing only after the model and selected cases have been made available for student practice and experimentation in most LCME-accredited medical schools.
- In summary, we strongly recommend that NBME continue to support CBT . . . We believe the NBME should continue its current level of developmental activity on the CBT project directed at ultimate use in the NBME certification sequence.

Additional results are available in the chapter entitled Testing & Certification.

Field Testing at Medical Schools. The National Board of Medical Examiners also is testing their new Computer-Based Examination (CBX) at 70 medical schools nationwide.

The exam includes multiple choice questions identical to those currently administered in the Part I, II, and III paper-based exams. In addition, the CBX includes an open-ended videodisc-based simulation that is designed to provide an uncued test of patient management skills.

Each participating school or test site was required to purchase three delivery systems, each consisting of an IBM-PC XT or equivalent, and either a Pioneer LD-V6000 series, Sony LDP-1200, or LDP-1500 videodisc player. The videodisc simulation portion uses a two-screen presentation method which eliminates the need for video overlay and keeps the cost per system at about $2,500.

While the entire CBX is still in a research phase to evaluate its effectiveness, the multiple choice part will be certified soon as a standard part of the exam process. The simulation will require additional research to determine the validity of scores for the open-ended procedure.

During 1988, 16,703 people took the part I exam, while parts II and III each were taken by more than 13,000. Stephen Clyman (CBX project director) sees the potential for multiple systems to be installed at each of the 144 medical schools in the US and Canada, with at least two sites per state.

Feedback from Test Sites. The NBME has collected and released summary evaluations provided by 23 of the CBX testing sites. The following is a review of these results.

The majority of students using the CBX cases were third year students (71.4%). They were scheduled to go through the cases either as tests or as preparation for class discussion. As each case was completed, printouts of actions, and the sequence of actions taken by each student, were made available to faculty.

The Medical College of Pennsylvania was the first to receive the CBX cases fifteen months ago, where they have been used extensively in the surgical department. Faculty at this institution reported that the greatest values of the CBX include assisting students to learn problem-solving, establishing priorities, and patient management. After running the CBX cases, students attended tutorial sessions where their cases were reviewed. The faculty and students discussed different approaches to each patient problem and the establishment of priorities. They also discussed how to ration time and how to distinguish between what constitutes an emergency and what is routine. Students reported that the CBX cases made it possible to achieve goals that were not otherwise attainable. Specifically, they cited the opportunity to actively play the role of a physician. Another advantage they noted was that anxiety was considerably reduced in working with the computer as compared to the anxiety experienced at the bedside.

A significant finding at George Washington University was reported. Fifty senior students ran ten cases each. In reviewing the simulation printouts, faculty found that six senior students took actions that were deemed highly inappropriate and raised questions about their problem-solving skills. What surprised the faculty was that, in all but one instance, these behaviors were not discovered from clinical evaluations of the students. According to Dr. Piemme, these simulations may be powerful tools to identify inappropriate behavior that cannot be evaluated clinically, such as "the ability to do parallel processing."

During their exit interviews, senior students commented that they learned more in a day of running the simulations than they could have learned in weeks in the clinical setting. As a consequence of the positive results achieved through use of the CBX simula-

tions, the department of medicine at George Washington began requiring other computer simulations. In addition, the obstetrics and gynecology department now administers their final examination by computer.

An unanticipated benefit was reported by the University of Michigan. "When many of the students neglected critical areas of patient diagnosis or management, there was much discussion among the faculty about methodologies for improving the teaching of those concepts."

At Johns Hopkins University, 56 students assigned the CBX cases scored significantly higher on the case management problems in their final examination than did the 138 preceding students (p.008). In addition, their self-assessment scores were higher for "identification of critical aspects of patient problems, recognition of life-threatening situations, recognition of psychosocial/patient education issues, and institution of timely interventions (p.001)."

In reviewing these 23 reports, several commonalties emerge: 1) student interest and enthusiasm for the simulations mirrored that of their faculty; 2) when student experiences were positive, awareness among faculty expanded and many implemented simulations from other sources; and 3) faculty believed that the CBX measures behaviors and skills that are not measured by other examinations.

Evaluation of Videodisc Use and Development at MSU.

The Pathology Department at Michigan State University has developed instructional units on Neuropathology using two types of videodisc systems: an IBM InfoWindow system and a two-screen Macintosh system. The purpose of this exercise was to determine undergraduate medical student response to this type of educational technology, to assess differences in development, and to obtain student evaluations of specific features of each system.

Using the *Slice of Life* videodisc distributed by the University of Utah, a unit on *Central Nervous System Neoplasms* was developed as a HyperCard stack for the Macintosh system, and a unit on *Cerebrovascular Disorders* was developed for the InfoWindow system using the LS-1 authoring system. Each unit consisted of five parts: a pretest, and instructional lesson, a post-test, a clinical simulation emphasizing reinforcement of concepts and problem-solving related to neuroanatomy, neuropathology and neurology, and a glossary.

The units were recommended to students for use on a supplemental basis and subjective evaluation was conducted. During the fall term of 1988, 68 of 119 students completed an evaluation form for at least one of the units and 52 of 119 completed forms for both units. The time spent by students on the lesson and case simulation sections was assessed.

The content and presentation for both were rated very good to excellent. Features that students emphasized as desirable included: 1) flexibility in controlling locations within sections (e.g. ability to go to the previous screen and randomly access any topic in the Macintosh unit), 2) easy access to glossary definitions, 3) diagrams and images, 4) availability of help screens, 5) high screen resolution, 6) integration of information from several disciplines, and 7) application of clinical and basic science information in a problem-solving case history format.

A one-screen system was not preferred in this setting. Difficulties experienced by students using each type of unit for the first time were assessed for future changes in Learning Resource Center procedures and program format. In comparison of development efficiency, the Macintosh HyperCard unit required less authoring time. In general, the availability of Neuropathology interactive videodisc instruction on both systems was enthusiastically received by the medical students and the features rated by students as most important were determined for consideration in development of additional units.

Videodisc Surveys

Factors Influencing Development and Use of Interactive Video in Nurse Education: A Delphi Study

This study was performed by Mary Anne Rizzolo as part of her recently completed doctoral program at SUNY in Brooklyn, NY. The purpose of the study was to identify factors impeding development and use of interactive video in nurse education in order to specify policies and procedures that would facilitate interactive video learning (IAVL) development and use.

Methodology. The opinion of nurse educators who have been involved in development of IAVL programs were solicited using the Delphi technique. The project consisted of three rounds of questionnaires. In the first round participants responded to open-ended questions. Responses from Round One were condensed into 95 Delphi items for the Round Two questionnaire. On Round Two, participants responded to statements by indicating their degree of agreement/disagreement on a five-point Likert scale. On Round Three, respondents received a copy of their own Round Two questionnaire with the addition of group feedback--frequency count, mean, and standard deviation. Participants reconsidered their responses in light of the group feedback and commented on statements, particularly if their response was in opposition to the majority of respondents. The final panel had 31 participants, 18 from academic environments, five from continuing education settings, and eight from the business sector.

Results. The nurse educators who participated in this study were able to identify obstacles to development and suggested ways to overcome them. The obstacles they named and the solutions they suggested were essentially the same as those which can be found in the instructional design literature. However, the participants did not state an opinion on a fairly large number of items. Ten or more respondents chose option three (neither agree nor disagree) for 22.6 percent of the statements on the questionnaire. This may indicate a lack of knowledge on some topics, or perhaps a lack of confidence in what they know about some issues.

Cost Factors. Most of the participants from academic settings offered educational solutions to obstacles, and were somewhat naive in relation to cost issues. On the other hand, respondents from continuing education and the business sector tended to be more practical and considered cost factors over and above all others when they wrote their initial responses on Round One, and when they responded to statements on the subsequent questionnaires.

Content. The subjects clearly identified the content they want in IAVL programs, and were especially united on application for simulations. They agreed on some applications

for generic discs and testing/evaluation programs, but were not as sure about how they wish to use tutorials.

Benefits. The panel seemed to have a general sense of some principles of instructional design, but were not as knowledgeable about specific design issues using features of videodisc. They agreed on the benefits of IAVL programs for students, but were less certain about how IAVL programs might affect faculty roles, and were quite undecided about the specific measurable advantages of IAVL in terms of reduction in learning time and cost of training/education. The participants were conservative in their predictions about how IAVL might change nurse education in the future, and did not offer any novel ideas or innovative approaches for the technology.

Chapter 7

Resources

The following is a listing of various resources for the optical disc industry. The listings in each category are meant to be used as a starting point for inquiries, and are not necessarily comprehensive.

Periodicals

Actronics Reporter is published by Actronics, Inc., producers and marketers of the Actronics Interactive Video Learning System. This free publication covers topics of interest to users of the system and the American Heart Association CPR/ACLS courseware. Actronics, 810 River Avenue, Pittsburgh, PA 15212; 412/231-6200.

CD Data Report focuses on the development of compact disc-read only memory (CD-ROM). Published monthly by DDRI, 510 North Washington Street, Suite 401, Falls Church, VA 22046-3537; 703/237-0682. Cost: $295 per year.

CD-ROM Enduser is a magazine for buyers and users of CD-ROM products and services. Subscriptions are free to qualified readers. Published monthly by DDRI, Incorporated, 510 North Washington Street, Suite 401, Falls Church, VA 22046-3537; 703/237-0682.

IBM MultiMedia Solutions is a promotional newsletter published by IBM Corporation's MultiMedia Solutions Division, PO Box 2150, Atlanta, GA 30055; 404/238-4646.

Interactive Media International Newsletter is a newsletter published in England by PLF Communications, Cross Street Court, Cross Street, Peterborough PE1 1UF England; 44/733-60535.

Interactive Healthcare Newsletter covers the development of videodisc, CD-ROM, digital optical disc and related technology in the health sciences. Published monthly by Stewart Publishing, Inc., 6471 Merritt Court, Alexandria, VA 22312; 703/354-8155. Cost: $70 per year.

IICS Reporter is the newsletter of the International Interactive Communications Society (IICS). Free with membership. The IICS is an association of communications industry professionals dedicated to the advancement of interactive technologies. The Society provides a forum for users and vendors to share ideas, applications, and techniques for the effective use of interactive media. Executive offices located at 2120 Steiner Street, San Francisco, CA 94115.

The Laserdisk Professional is a journal devoted to optical disc technology in the library and information center markets. Published by Pemberton Press, 11 Tannery Lane, Weston, CT 06880; 203/227-8466.

The Lasertrader is a newsletter for those interested in buying, selling, and trading videodiscs. Consumer oriented. P.O. Box 2111, Huntington, WV 25721.

Medical Documentation Update reports on issues surrounding the medical records industry. Includes information on the use of digital optical discs and optical cards. Institute for Medical Records Economics, 121 Mount Vernon Street, Boston, MA 02108; 617/720-2229.

MegaBite: A Computing and Informatics Newsletter for Dental Educators contains equal parts DOS and Macintosh computer news, with the remainder devoted to general issues pertaining to dental informatics, including American Association of Dental Schools (AADS) infotech consortia news, courseware development, videodisc initiatives, and hardware/software compatibility issues. Subscriptions are $20 for the year. Contact John Williams, Department of Oral Health, Health Sciences Center, University of Louisville, Louisville, KY 40292.

Memoires Optiques is an international videodisc, CD-ROM, and digital optical disk journal. Published monthly by ARCA Editions (France). Administrative office: *Memoires Optiques*, P.O. Box 303, 56007 VANNES CEDEX, FRANCE; phone 33.97.63.77.30.

Multimedia Computing, will be published quarterly beginning with the Winter 1990 issue and will provide end-user readers information that will help them implement and use multimedia computing. The subscription price is $77 (personal subscriptions are $29). Meckler Corporation, 11 Ferry Lane West, Westport, CT 06880; 203/226-6967.

Nebraska Videodisc Design/Production Group News provides information on the activities of the Nebraska Group and the use of videodisc technology for education and training. Published quarterly by the Nebraska Group, KUON-TV, University of Nebraska-Lincoln, P.O. Box 83111, Lincoln, NE 68501-3111; 402/472-3611. Cost: Free.

Nursing Educators Microworld is a newsletter that reports on the use of microcomputer and videodisc instruction for nursing education. Published bi-monthly by Christine Bolwell, RN, MSN, 13740 Harleigh Court, Saratoga, CA 95070; 408/741-0156. Cost: $54/year, half-price ($27/year) for nurse educators.

Optical Information Systems magazine presents articles on the development and uses of optical media in publishing, teaching, storage, and training. Published bi-monthly by Meckler Corporation, 11 Ferry Lane West, Westport, CT 06880; 203/226-6967. Cost: $95 per year.

Optical Information Systems Update (ISSN 0887-5162) is the companion newsletter to *Optical Information Systems* magazine and covers all optical-based storage media. Published twice monthly by Meckler Corporation, 11 Ferry Lane West, Westport, CT 06880; 203/226-6967. Cost:$189.50 per year.

Optical Memory News is a detailed monthly industry newsletter that focuses on mass storage of data, storage of document images, and read-only and interactive videodisc applications. Cost: $295 per year. Rothchild Consultants, 256 Laguna Honda Blvd., San Francisco, CA 94116; 415/681-3700.

The Videodisc Monitor (ISSN 0739-7089) covers application, innovation, and technology within interactive video, compact disc, and related fields. Published monthly by Fu-

ture Systems, Incorporated, Post Office Box 26, Falls Church VA 22046-0026; 703/241-1799. Cost: $227 per year.

Books

Advanced Interactive Video Design ($45). This publication reviews the latest applications of interactive videodisc technology, delineates design principals, and explains the steps to developing a videodisc program. Published in 1988 by Knowledge Industry Publications (ISBN 0-86729-0790X).

Authoring Systems ($36.95). This book provides a guide for readers to compare, contrast, and select from dozens of computer packages that help users to program computer-assisted instruction. Published in 1988 by Meckler Corporation (ISBN 0-88736-0840X).

CD-I: A Designer's Overview ($39.95). This 240-page book was written by Philips engineers and technicians and is an introduction to CD-I technology. The seven chapters cover the basics of the technology as well as proposed applications of the new technology. Published in 1988 by Kluwer Technical Books (The Netherlands) and distributed in the U.S. by McGraw-Hill, Suite 4-19, 11 West-19th Street, New York, NY 10011

CD-I and Interactive Videodisc Technology ($24.95). Systems and applications experts explain how videodisc and CD-I formats are alike, how they differ, and what their coexistence means to designers, marketers, and users. Published by Howard Sams and Company in 1986 (ISBN 0-672-22513-1).

CD-ROM Handbook ($59.95). A compendium of information on CD-ROM hardware, software, and manufacturing written by acknowledged experts in the industry. Chapters on CD-ROM and LANs, DVI, designing a CD-ROM information structure, artificial intelligence and expert systems, and more. Published in 1988 by Intertext Publications and McGraw Hill (ISBN 0-07-056578-3).

CD-ROM Yearbook: 1989-1990 ($79.95). This is a dynamic sourcebook of facts, statistics, forecasts, articles, reviews, profiles, and analysis of the CD-ROM industry and its products. Includes articles, listings, and projections for and about CD-ROM and related technologies such as CD-I and DVI. Published in 1989 by Microsoft Press (ISBN 1-55615-179-9).

CD-ROM: The New Papyrus ($21.95). Microsoft Press asked Bill Gates, David Hon, Rockley Miller, and other leading experts to submit their perceptions and recommendations on the technology and future of CD-ROM. Published by Microsoft Press in 1986 (ISBN 0-914845-74-8).

CD-ROM 2: Optical Publishing ($20.95). This second volume from Microsoft Press is designed to give publishers, technical managers, and entrepreneurs a comprehensive, timely overview of the entire optical publishing process. (ISBN 1-555615-000-8).

Compact Disc-Interactive: A Designer's Overview ($39.95). A detailed, comprehensive primer on the technology, design, and applications of CD-I. Published in 1988 by McGraw-Hill (ISBN 0-07-049816-4).

Digital Video in the PC Environment ($39.95). A complete introduction to the combination of personal computer technology and digital audio/video. The book brings readers of diverse technological backgrounds up to date with current Intel Digital Video Interactive (DVI) technology. Published in 1989 by McGraw Hill (ISBN 0-07-039176-9).

The Disconnection: Interactive Video and Optical Disc Media ($45). This book illustrates how interactive video is succeeding in point-of-purchase sales, employee training, classroom teaching, and information storage. Published in 1988 by Knowledge Industry Publications (ISBN 0-86729-218-0).

Educator's Handbook to Videodisc ($22.95). Revised in 1987, this book presents basic facts about the technology, augmented with extensive appendices detailing available players, interfaces, monitors, peripherals, systems, educational titles, mastering options, authoring languages, and resources. Published by the Association for Educational Communications and Technology in 1987 (ISBN 0-89240-049-8).

The Compact Disc Book ($12.95). Offers a history of the technology, guide to consumer players and discs, and a look at the future of the medium. Published in 1988 by Harcourt Brace Jovanovich, Inc. 111 Fifth Avenue, New York, NY 10003; 212/614-3000.

Interactive Optical Technology in Education and Training: Markets and Trends ($39.95). Describes the current use of interactive optical technologies in the major education and training markets: industrial training, management/professional education, medicine, government, and public/higher/adult education. Published by Meckler Corporation, 11 Ferry Lane West, Westport, CT 06880; 203/226-6967.

Interactive Video ($24.95). Part of the Educational Technology Anthology Series, this book is a compilation of thirty articles that recently appeared in Educational Technology magazine dealing with interactive video. Published in 1989 by Educational Technology Publications (ISBN 0-87778-206-7).

Interactive Video ($19.95). This book provides the basics of the technology and explains which training problems interactive video will solve. Describes step-by-step design, production, pre-mastering, review, and approval of the finished program. Published in 1988 by Educational Technology Publications (ISBN 0-87778-206-7).

Nursing Educators MicroWorld Volume One—Plus ($37.95). Includes the first six issues of the newsletter of the same name, a list of discounted software, directories of IBM and Apple computer software, directory of videodisc courseware, and index, and other resources. Published by Diskovery, 13740 Harleigh Court, Saratoga, CA 95070; 408/741-0156.

Opening Minds: The Evolution of Videodiscs and Interactive Learning ($29.95). A historical perspective on the use of technology in public education and a comprehensive chronology of videodisc technology from the 1890s to the present. Published in 1989 by Future Systems, Inc. (ISBN 0-8403-5191-7).

Practical Guide to Interactive Video Design ($34.95) Disc veteran Nick Iuppa offers a blueprint of techniques for the design and production of interactive video programs. Shows how interactive video programs can be used in training, retail, educational, and other applications. Published in 1984 by Knowledge Industry Publications (ISBN 0-86729-041-2).

Should Schools Use Videodiscs? ($35). The Institute for the Transfer of Technology to Education assembled this special report to help its members weigh the merits of interactive technology in the classroom. Published by the National School Boards Association in 1986.

Using Video: Interactive and Linear Designs ($34.95). This book promotes the importance of good design in its treatment of 40 techniques that are both creative and practi-

cal. Includes 18 linear and 22 interactive techniques to help readers plan their own productions. Published by Educational Technology Publications in 1989 (ISBN 0-87778-199-0).

The Videodisc Book ($25). Published in 1984 by John Wiley and Sons, this book contains a compilation of articles in the industry as well as a directory of production and development sources.

Videodisc Repurposing is a monograph written by Craig Locatis, PhD and published by the Lister Hill National Center for Biomedical Communications, a branch of the National Library of Medicine. Educational Technology Branch, Lister Hill National Center for Biomedical Communications, National Library of Medicine, Bethesda, MD 20894; 301/496-6280.

Videodisc Technology was written by Eldon Ullmer, PhD and published by the Lister Hill National Center for Biomedical Communications, a branch of the National Library of Medicine. It consists of four sections covering videodisc technology and formats, compact disc systems, and factors to consider when selecting a videodisc system. Educational Technology Branch, Lister Hill National Center for Biomedical Communications, National Library of Medicine, Bethesda, MD 20894; 301/496-6280.

Directories/Reference

CD-ROMs in Print: 1990 ($37.50). A comprehensive listing of CD-ROM products, providers, and distributors. Published in 1989 by Meckler Corporation (ISBN 0-887636-359-8).

CD-ROM Sourcebook ($725). This regularly updated manual is a thorough reference work of hardware, software, and services in the growing field of CD-ROM. Contains sections on mastering and replication, CD-ROM drives, CD-ROM systems, search software, data preparation, CD-ROM titles, interfaces and controllers, licensees, publications and articles, and consultants. Published by Diversified Data Resources, Inc., 510 North Washington Street, Suite 401, Falls Church, VA 22046-3537; 703/237-0682.

Complete Interactive Video Courseware Directory ($60). This volume contains information on more than 250 interactive video available course for computer, electronics, financial, manufacturing, medicine, and sales/management. Published in 1989 by Convergent Technologies Associates.

IBM MulitMedia Courseware Pocket Guide (G5804033). Contains a listing of Infowindow Touch Display courseware and vendor sources for both custom and generic software. Available from local IBM marketing representatives.

Interactive Video Compatibility Guide ($49). A long-awaited guide to compatibility for the videodisc industry. Contains clear and concise summaries of compatibility issues, cabling guides, hardware specifications, comparative tables, and pro-con evaluations of the most popular hardware components and systems. Published in 1990 by Stewart Publishing, Inc. (ISBN 0-936999-11-X).

Interactive Video Directory ($65). Contains references to over 1000 producers, manufacturers, universities, and users of interactive video. Published in 1987 by Applied Interactive Technology (ISSN 0743-4537).

Interactive Video Primer: Medical Education ($49). Provides an overview of the use of interactive video for medical education. Chapters include videodisc and videodisc hard-

ware, commercial courseware, medical schools, professional associations, research, and resources. Published in 1990 by Stewart Publishing, Inc. (ISBN 0-936999-13-6).

Interactive Video Primer: Nursing Education ($39). Provides an overview of the use of interactive video for nursing education. Chapters include videodisc and videodisc hardware, commercial courseware, nursing schools, testing & certification, research, and resources. Published in 1990 by Stewart Publishing, Inc. (ISBN 0-936999-12-8).

International Directory of Interactive Multimedia Producers ($35). Lists 350 companies and individuals who are in the business of creating and producing interactive multimedia. Published by Multimedia Computing Corp., 2900 Gordon Avenue, Suite 100, Santa clara, CA 95051; 408/245-4750.

International Interactive Communication Society Membership Directory list the members of this professional society. Membership is $50 per year for individuals.

Laser Videodisc Companion ($16.95). A guide to the best and worst laser videodiscs. A 432-page volume which reviews 1200 entertainment, education, and imported discs. Published in 1988 by New York Zoetrope, 838 Broadway, New York, NY 10003; 800/242-7546 or 212/420-0590.

MedicalDisc Directory ($90). A listing of more than 430 health-related videodisc projects and CD-ROM data bases. Updated annually. Published by Stewart Publishing, Inc., 6471 Merritt Court, Alexandria, VA 22312; 703/354-8155.

Optical Information Systems Buyer's Guide & Consultant Directory . A listing of names and address of more than 5,000 contacts involved with optical information systems. Annual issue of journal with same name, available to subscribers from Meckler Corporation.

Software for Health Sciences Education: An Interactive Resource ($45). A series of HyperCard stacks which describe educational computer software currently available to health science students and professionals. Published by Learning Resource Center, University of Michigan Medical Center, 1135 East Catherine, Ann Arbor, MI 48109-0726.

Sony View System Courseware and Authoring Guide catalogs videodisc programs that play on the Sony View system. Available from local Sony sales representatives.

Videodisc & Related Technology: A Glossary of Terms ($7.95). The editors of *The Videodisc Monitor* have compiled a complete dictionary of over 500 definitions of key terms. Published by Future Systems, Inc. in 1986 (ISBN 0-938907-02-6).

Videodisc Compendium for Education & Training ($12.50). Lists more than 600 videodisc titles in 36 subject areas, ranging from arts and literature, math and science, to career guidance and computer training. Published in 1989 by Emerging Technology Consultants, PO Box 12444, St. Paul, MN 55112; 612/639-3973.

The Videodisc Connection: A Directory of Service Suppliers is a free listing of vendors who provide videodisc design, production, premastering, programming, etc. Published by the Optical Recording Project/3M, Building 225-4s, 3M Center, St. Paul, MN 55144-1000; 612/733-2142.

Videodiscs in Education: A Directory lists videodiscs appropriate for the education marketplace. Published by the Minnesota Educational Computing Consortium, 3490 Lexington Avenue North, St. Paul, MN 55126.

Market/Research Reports

Electronic Retailing ($250). Offers a comprehensive view of the emerging market structure and outlines objectives, opportunities, and pitfalls faced by industry participants. Published in 1986 by Knowledge Industry Publications.

CD-ROM Software: Textual Retrieval and Networking Issues ($1990). An analysis of the CD-ROM software industry. Published in 1987 by Information Workstation Group, 501 Queen Street, Alexandria, VA 22314; 703/548-4320.

Key Vertical Markets: The Impact of Optical Publishing. Addresses the use of CD-ROM technology in five market areas: medical, financial, legal, marketing and demographics, and architecture/engineering. Published in 1987 by LINK Resources Corporation, 79 Fifth Avenue, New York, NY 10003; 212/620-3099.

Non-Consumer Market for Videodisc Technology ($1800). This report predicts sales of non-consumer videodisc programs will rise in dollar value from $140 million in 1987 to $605.56 million by 1991. Hardware forecast to rise from $209.25 million to $453.06 million in the same period. Published in 1987 by Frost and Sullivan, 106 Fulton Street, New York, NY 10038; 212/233-1080.

Nursing Education, A Promising Market for Interactive Video ($240). Provides a look at a market that spends an estimated $10- $18 billion annually on education and training. Chapters include an overview of the hospital and nursing school markets, penetration of microcomputers in nursing education, the emerging role of interactive video, factors affecting software and hardware sales, and sales projections for the 1990s. Included in the report are more than 50 charts and graphs detailing key figures and trends. Also included is a complete description of videodisc programs for nursing education. Published in 1990 by Stewart Publishing, Inc., 6471 Merritt Court, Alexandria, VA 22312; 703/354-8155.

Optical Disc Strategies for Electronic Publishers ($750). Examines potential changes in electronic publishing from the emergence of optical discs in data distribution. Breaks the electronic publishing market into eight specific application areas and provides estimates of market size and shares, plus CD-ROM and videodisc player penetration in each area. Published in 1984 by LINK Resources.

Optical Technology's Impact on Paper, Microform, and Magnetic Disk and Tape Storage ($1,500). This report describes the growth opportunities and applications for CD-ROM, CD-I, WORM, and erasable optical drives. Published in 1988 by Electronic Trend Publications (ISBN 0-914405-23-3).

State of the CD-ROM Industry: Applications, Players, and Products ($1590). This two-volume set features market and technology forecasts, vertical market analyses, an industry directory, charts, and guidelines. Published in 1988 by Information Workstation Group, 501 Queen Street, Alexandria, VA 22314; 703/548-4320.

The U.S. Videodisc Market ($795). Features a concise and thorough review of individual sub-markets and includes complete forecasts of sales, installed base, and growth rate of each submarket through 1990. Published in 1985 by Future Systems, Inc.

Use and Effectiveness of Videodisc Training ($49.95). Surveys the results of comprehensive studies evaluating the effectiveness of interactive videodisc as a training medium.

Includes 30 studies by corporate, government, military, and educational users conducted between 1980 and 1987. Published in 1988 by Future Systems, Inc.

Videodisc in Electronic Selling ($750). Examines the use of interactive videodisc in the point-of-purchase and electronic marketing industry. Includes an industry overview, case studies, vendor profiles, implementation strategies, and market projections. Published in 1984 by LINK Resources.

Videodisc Training: A Cost Analysis ($49.95). Provides a cost comparison of classroom versus self-paced interactive instruction. Includes brief history of videodisc technology, guidelines for choosing your courseware delivery system, cost analysis, calculations for a sample course, and break-even analysis. Published in 1987 by Future Systems Inc.

Videodiscs in Museums ($49.95). Features an international listing of museums that use videodiscs and a directory of resources. Published in 1987 by Future Systems, Inc.

Videodiscs in Healthcare: A Guide to the Industry ($135). A complete desk reference on the use of optical disc technology in the healthcare industry. Contains a wealth of information on how interactive video is being used by companies, schools, and other organizations in the healthcare field. Published in 1989 by Stewart Publishing, Inc. (ISBN 0-936999-08-X).

Computer Software

Interactive Toolkit ($104.50). This package for the PC is a workbook and software program that teaches novices to design and produce computer-based training and interactive videodisc programs. Included are models, worksheets, and flowcharts plus Arthur, a demonstration authoring system for MS-DOS computers. Published in 1987 by OmniCom Associates (ISBN 0-944650-01-5).

Training Cost Model ($49.95). This program allows the user to insert base costs, training numbers, and other pertinent data—then it compares per-person training costs for interactive video or CBT versus traditional lecture-based courses. Published in 1988 by Future Systems Inc. (ISBN 0-938907-11-5).

Videotapes/Videodiscs

Interactive Healthcare Demos (VHS $45) is a 90-minute tape containing videotaped demonstrations of the best commercial videodisc programs as well as award-winning programs by the National Library of Medicine, U.S. Navy, and various health sciences schools. Available from Stewart Publishing, Inc.

Creating Slice of Life (VHS $45) is a 90-minute demonstration videotape which reviews the process of transferring medica images to videodisc and the educational applications designed using the University of Utah's *Slice of Life* videodisc. Available from Stewart Publishing, Inc.

Interactive Healthcare Demos II--Nursing (VHS $35) is a 45-minute demonstration of four commercially available videodisc programs which are suitable for nursing education. Available from Stewart Publishing, Inc.

Interact 87 (Two VHS Videotapes, $75). This video conference on interactive videodisc design features a demonstration of the award-winning Oxyacetylene Welding

simulator by David Hon (Ixon) and Greek Vases, an interactive exhibit by Interac Corporation for the J. Paul Getty Museum. Published in 1987 by the IICS.

Interactive Video Archive (VHS $25) is compiled from tapes presented during the CAIV Showcase held in Atlanta at the annual Association for Educational Communications Technology (AECT) conference. Contact Dr. John F. Moore, Educational Technologies Division, Learning Resource Center, Old Security Building, Blacksburg, VA 24061.

Interactive Winner's Circle (VHS $129, CLV Videodisc, $149). This program is a teleconference sponsored by the IICS and the Nebraska Group in conjunction with the 1987 Nebraska Videodisc Symposium. Features presentations from the 1987 Nebraska Award winners. Published by the IICS. Available from Future Systems, Inc.

Optical Discs: An Information Revolution (Three VHS Videotapes, $250). The IEEE satellite video conference took place in 1987 and brought together top experts in the field to examine the economics, technological and application trends and major players in the business. Published by the IEEE. Available from Future Systems, Inc.

Conferences/Workshops

Association for the Development of Computer-Based Instructional Systems (ADCIS), Miller Hall 409, Western Washington University, Bellingham, WA 98225; 206/676-2860. A professional association with many special interest groups (SIGs), including the Interactive Video-Audio SIG and the Health SIG. Both SIGs focus heavily on videodisc applications in the health sciences. Annual meetings held in November.

Fuld Institute for Technology in Nursing Education (FITNE), 28 Station Street, Athens, OH 45701; 614/592-2511. FITNE hosts workshops to teach interactive video development. The 4-1/2 day, hands-on workshops focus on design and authoring techniques. Working in small teams, participants actually develop an interactive lesson during the session. Participants will learn the *Quest* authoring system as well as the *Interactive Video Design Toolkit* program. Production and videodisc premastering techniques also are presented.

Health Sciences Communications Association (HeSCA), 6105 Lindell Blvd., St. Louis, MO 63112; 314/725-4722. Heavily oriented toward video production, HeSCA annual meetings, held in March, are increasingly including presentations on videodisc applications.

The Institute for Graphic Communication, 375 Commonwealth Avenue, Boston, MA 02115; 617/267-9425. Sponsors a series of small conferences, usually in Florida and California, on optical disc applications. Recent titles include "Outlook for Compact & Videodisc Systems and Applications" and "CD-I: Birth of a Billion Dollar Industry". Two and one half days of presentations.

Institute For Medical Record Economics, Inc., 121 Mount Vernon Street, Boston, MA 02108; 617/720-2229. Sponsors the Computerization of Medical Records conference annually in the spring. Three days of presentations, including the use of optical discs.

Learned Information, Inc., 143 Old Marlton Pike, Medford, NJ 08055; 609/654-6266. Sponsors the Optical Publishing conference (USA) and the Optical conference (Amsterdam 1987). Three days of presentations and exhibits.

Meckler Publishing Corporation, 11 Ferry Lane West, Westport, CT 06880; 203/226-6967. Sponsors the Optical Information Systems (OIS) conference held annually in December. OIS is three days of conference sessions and exhibits.

Nebraska Videodisc Design/Production Group, KUON-TV/University of Nebraska-Lincoln, P.O. Box 83111, Lincoln, NE 68501; 402/472-3611. Sponsors the Nebraska Videodisc Symposium annually in September. Three days of presentations and exhibits. Also sponsors a series of Nebraska Videodisc Workshops where participants actually design and produce an interactive videodisc. Offers Basic, Intermediate, and Advanced workshops several times a year.

Online International Inc., 989 Avenue of the Americas, New York, NY 10018; 212/279-8890. Sponsors CD-I/The Future conference, held May 1987 in San Francisco. Two and one-half days of presentations.

Rothchild Consultants, 256 Laguna Honda Blvd., San Francisco, CA 94116; 415/681-3700. Sponsors a series of conferences on optical storage technology. Recent titles include "Optical Storage for Small Systems" and "The Future of Optical Memory Technology". Three days of presentations.

Society of Photo-Optical Instrumentation Engineers (SPIE), P.O. Box 10, Bellingham, WA 98227; 206/676-3290. Sponsors the Optical Mass Data Storage conference, the 1986 program held in October in San Diego. Four and one-half days of conference sessions and exhibits.

Stewart Publishing, Inc. 6471 Merritt Court, Alexandria, VA 22312; 703/354-8155. Sponsors periodic symposia and conferences on videodisc, optical disc, CD-ROM, and related technology—including the Interactive Healthcare conference held in June each year. Three days of presentations, exhibits, and workshops.

Symposium Computer Applications in Medical Care (SCAMC), c/o Continuing Medical Education, George Washington University, 2300 Eye Street, NW, Washington, DC 20037; 202/994-8928. The annual SCAMC meeting is designed to inform physicians, healthcare administrators, biomedical scientists, engineers, nurses, and other healthcare professionals about current and potential applications of computer technology to healthcare and to identify areas of research and development that need to be addressed. Annual meeting held in November.

Associations/Special Interest Groups

Association for the Development of Computer-Based Instructional Systems (ADCIS), Miller Hall 409, Western Washington University, Bellingham, WA 98225; 206/676-2860. A professional association with many special interest groups (SIGs), including the Interactive Video-Audio SIG and the Health SIG. Both SIGs focus heavily on videodisc applications in the health sciences.

British Interactive Video Association, is a professional group bringing together about 40 British companies who have made an interactive videodisc. The organization is funded by contributions from its members. For information about the BIVA, contact the National Interactive Video Centre, 24-32 Stephenson Way, London NW1 2HD; 1/387-2233.

Fuld Institute for Technology in Nursing Education, 28 Station Street, Athens, OH 45701; 614/592-2433. Funded by the Helene Fuld Health Trust, the Institute serves as a

clearing house for both hardware and software related to the use of computer and interactive video technology in nursing education. FITNE makes use of newsletters, electronic bulletin boards, and a telephone support service.

Health Sciences Communications Association (HeSCA), 6105 Lindell Blvd., St. Louis, MO 63112; 314/725-4722. Heavily oriented toward video production, HeSCA meetings are increasingly including presentations on videodisc applications.

Healthcare Interactive Videodisc Consortium (HCIVC). Organized in 1988 by IBM Corporation, the HCIVC consists of 14 medical and nursing schools in the US and Canada who have entered into a contract to develop five videodisc modules each on health sciences topics. In return for developing these programs, IBM provides some technical and hardware support. The programs will be made available for distribution. For more information, contact Paula O'Neill, HCIVC Chairperson, Instructional Resources, The University of Texas, MD Anderson Cancer Center, 1515 Holcombe Blvd., Houston, TX 77030; 713/792-6730.

Health Sciences Consortium, 201 Silver Cedar Court, Chapel Hill, NC 27514; 919/942-8731. The HSC is a nonprofit cooperative created in 1971 to enable health sciences institutions to share instructional materials. The HSC will be distributing some of the HCIVC programs. Membership is $1,000 per year.

Interactive Healthcare Consortium, c/o Stewart Publishing, Inc., 6471 Merritt Court, Alexandria, VA 22312; 703/354-8155. The Interactive Healthcare Consortium (IHC), formerly the MDR Videodisc Consortium (MDRVC), is an educational publishing cooperative dedicated to the development and distribution of interactive videodisc courseware in the health sciences. Membership includes schools of medicine, nursing, dentistry, allied health, pharmacy, and public health as well as hospitals, professional organizations, and pharmaceutical companies. Membership is $300 per year ($150/year for schools of nursing). Members receive the Interactive Healthcare newsletter (published monthly) and discounts on the purchase of videodisc courseware, hardware, and authoring tools.

Interactive Video Industry Association (IVIA), 1700 North Moore Street, Suite 1905, Arlington, VA 22209; 703/408-1000. The IVIA is a trade association serving the interactive video industry by promoting interactive video technology to business and government and by working toward the establishment of universal industry standards. The IVIA is the administrative body of Tech 2000, a showcase for interactive media located in the Techworld Trade Center in Washington, D.C.

International Interactive Communications Society (IICS), 2120 Steiner Street, San Francisco, CA 94115; 415/922-0214. A professional association which promotes the use of interactive communications in business, industry, medicine, education, and the arts through the sharing of ideas, information, and experiences. There are 25 established and organizing chapters located throughout the U.S., Canada, England, France, and Germany

Medical Interactive Video Consortium (MIVC). The MIVC was formed in 1987 to increase the effective use of interactive video in medicine and medical education. For more information, contact the MIVC c/o Frank Toth, Uniformed Services University of the Health Sciences (USUHS), 4301 Jones Bridge Road, Bethesda, MD 20814; 202/295-6261.

CONVINCE (Consortium of North American Veterinary Interactive New Concept Education) is a not-for-profit organization allied with the American Veterinary Medical Association. The primary purpose of CONVINCE is to encourage cooperative development and

sharing of interactive video and hypermedia programs for veterinary medical education. For more information about CONVINCE, contact Dr. W.F. Keller, President, College of Veterinary Medicine, Michigan State University, East Lansing, MI 48824-1316; 517/355-7624.

Film Festivals/Awards

Nebraska Awards. Each year videodisc awards are made at the Nebraska Videodisc Symposium. Award categories are Best Educational Achievement, Best Industrial/Military Training Achievement, Best Consumer Achievement, Best Data Bank Achievement, and Best Overall Achievement. In 1984, two health-related videodisc projects received honors The University of Iowa's *Assessment of Neuromotor Dysfunction In Infants* and the University of West Florida's interactive training system to teach skills to social workers. 1986 recipients included two health-related productions which shared the Best Educational Achievement award. They were *Shotgun Wound to the Abdomen* by Intelligent Images, Inc. and *The Case of Frank Hall* by the National Library of Medicine.

In 1987, three health-related production received awards. *Combat Trauma Training* (U.S. Navy) received the Best Overall Production award, *Introduction to Cardiovascular Examination* (Mirror Systems) received the Best Education Production award, and *The Suicidal Adolescent* (National Institute of Mental Health) received an Honorable Mention. 1988 recipients included three health-related videodisc projects which received Certificates of Merit this year: *A Right to Die? The Case of Dax Cowart*, submitted by the Center for Design of Educational Computing, Carnegie Mellon University, Pittsburgh, Pennsylvania, *Recognition & Management of Abdominal Conditions*, submitted by Lunaria Incorporated, and *The Second Slice of Life*, submitted by the University of Utah, Salt Lake City, Utah.

John Muir Medical Film Festival, 1601 Ygnacio Valley Road, Walnut Creek, CA 94598; 415/947-5303. Three medical videodiscs were pronounced award-winning productions by the judges of the 1986 John Muir Medical Film Festival. In all, there were 33 winners and 43 Silver Certificate Award recipients in a contest that involved more than 400 entries from across the United States and eleven foreign countries. All entries were placed in one of more than 50 medical content categories and judged based on content, production value, and instructional design.

Shotgun Wound to the Abdomen the now familiar production done by the Lunaria group for Intelligent Images, Inc. was the winner in the Emergency Medicine category. Two other videodiscs received second place Silver Certificate Awards: *The Case of Frank Hall*, produced by the National Library of Medicine, and *The Active Knee,* produced by the Alive Center with the Sandy Corporation. The winning productions from the festival were shown at the National Library of Medicine in Bethesda, Maryland as part of the library's 150th Anniversary Celebration in October.

Association of Visual Communicators (AVC) Cindy Awards. As an adjunct to the CINDY Awards competition, AVC hosted a month-long Showcase of Interactive Videodisc Technology. The Showcase featured hands-on demonstrations of a broad range of computer/videodisc systems, including those offered by IBM, Sony, Pioneer, and Visage. More than 35 videodisc programs were entered, four having a health care theme. These were the *BioSci Videodisc* by Videodiscovery, *The Active Knee* by the ALIVE Center, *The Challenge of Antibiotics* by Lancit Media Productions, and *Abdominal Stab Wounds: Donnie Brooks* by Intelligent Images.

The Interactive Videodisc category was introduced into the AVC CINDY competition for the first time in 1985. Gold, Silver, Bronze, Honorable Mention, and Special Achievement Awards are given in various categories. 1986 health-related winners were *Abdominal Stab Wounds*, which won a Gold award in the Education category, and *the BioSci Videodisc,* which was presented a Special Achievement Award for pioneering work in visual database.

Demonstration Centers/Clearing Houses

National Library of Medicine

The National Learning Center for Interactive Technology opened in March 1985 at the National Library of Medicine as a central location where various computer-video information and educational technologies are demonstrated, reviewed, and evaluated. The Learning Center a hands-on laboratory where visiting medical educators and scientists can explore the comparative applications and various uses of interactive educational technology in the health sciences. The Center is part of the Lister Hill National Center for Biomedical Communications, the branch of the Library responsible for conducting research in health communications.

The staff of the Learning Center acquire working prototypes and commercially available products for health science education. Visitors are encouraged to try out the programs and study the assumptions underlying their design. The Learning Center staff provide individual and small group tutorials and demonstrate the diversity of courseware and the alternative approaches available when designing interactive programs.

The Learning Center's collection consists of courseware for use with microcomputer systems, often in conjunction with touchscreen, bar code reader, digital speech, voice recognition, CD-ROM, reflective videodisc, and write-once optical disc technology. The following are some of the videodisc and CD-ROM applications housed at the Learning Center for Interactive Technology:

The NLM Video Picture List demonstrates the use of videodisc technology as a visual database and catalog of pictures from the NLM History of Medicine collection.

The Microanatomy Video Library takes the concept of the visual database to the next technology level. Over 2,000 microanatomical images located on a videodisc are accessed by the user through a free-text database program running on an attached microcomputer.

The Anatomy of the Knee contains a library of anatomic, magnetic resonance, and computer tomography images of the human knee in three planes (sagittal, axial, and coronal). These images can be used under computer control to compare anatomical and electronic images of the knee in all three planes. A series of test questions is included to assess the student's mastery of this content area.

Visual Database with Barcode Access demonstrates the use of barcodes for the random selection access of videodisc images and sound. With texts retrofitted with barcodes, or with texts specifically designed to incorporate them, the student has the flexibility of augmenting the information provided by the text as needed.

Medical Emergency Simulation with Touchscreen (DxTER) is a Level III application with touchscreen developed by Intelligent Images, Inc. The simulation is a realistic, highly interactive emergency situation done in real time.

Teenage Suicide Prevention is an application for mental health students to help raise their consciousness level concerning the hidden signs of an impending teenage suicide. This videodisc program includes a series of simulations of depressed adolescents.

Technological Innovations in Medical Education (TIME) are voice-activated patient management simulations. The microcomputer is trained to recognize the user's voice with a selected vocabulary of medical words and phrases which provide the basis for interacting with the program.

AI/RHEUM is an artificial intelligence consultant system in rheumatology intended for the use of practicing physicians not having specialty training in that field.

PathMac was developed at Cornell University and demonstrates the concept of hypertext/hypermedia. The program is Macintosh-based and uses a recordable WORM videodisc for the delivery of conventional video images and the computer's hard disk and screen for the delivery of digitized images.

The Echocardiography Videodisc Encyclopedia was developed with Yale University and is a videodisc-based library of echocardiographs. The accompanying program uses a hypermedia environment to teach echocardiographic image interpretation using online text, animated graphics, and digitized sound.

The Electric Cadaver was designed at Stanford University as a general prototype of electronic multimedia books. Using the Macintosh computer in a hypermedia environment, the system displays images on two screens. The text, graphics, and video are extensively cross-referenced, making it possible for a user to jump from picture to text to video and back.

Medline on CD-ROM demonstrates the use of Compact Disc-Read-Only Memory technology. A subset of the Medline database and an associated search algorithm are stored on a compact disc for quick and easy access.

The National Board of Medical Examiners' CBX System is a series of interactive patient simulations. Each CBX case presents a simulated patient in an uncued, patient management environment. The student is expected to diagnose, treat, and monitor the patient's condition as it changes over time and in response to treatment.

Computer-based Curriculum Delivery System in Pathology is a series of 10 videodisc lessons developed at Lister Hill and designed for use in the medical school basic pathology curriculum.

E.T.Net Electronic Bulletin Board is billed as "an online computer conference dedicated to users of computers in medical education." E.T.Net is designed to electronically link developers and users of interactive technology in health care education. Its primary purpose is to help alleviate a major problem faced by medical educators today, i.e. the lack of good information on medical interactive courseware. E.T.Net provides information on what courseware is available, where it can be obtained, which programs are useful, and what needs to be developed.

Users of E.T.Net are able to share software, hardware, and videodisc reviews; information on current and upcoming courseware and videodiscs; and news on new applications of interactive technology in medical education. E.T.Net is open to professionals engaged

in either the development or use of interactive technology in medical education. It is available at no cost, 24-hours a day, seven days a week, 365-days a year. The service may be accessed via the Telenet network by a local phone call to your local Telenet node. The Telenet address is 301 565. To register for your fee account, call E.T.Net and gain access by typing etnet in lower case letters. E.T.Net will provide further instructions. Help and a User's Guide are available online. A pocket Quick Reference Guide may be requested from the Learning Center for Interactive Technology.

TECH 2000

The Interactive Video Industry Association (IVIA), in conjunction with Techworld developer International Developers Inc. have established the Tech 2000 showcase and gallery in Techworld Plaza, Washington, DC. Billed as a museum of the future, Tech 2000 is the first major interactive information technology demonstration site open to the general public. The Techworld World Technology Trade Center is strategically located between the Capitol and the White House and directly opposite the Washington Convention Center. Tech 2000 occupies 10,000 square feet and provides a high-profile center for the display and interpretation of emerging technologies, with an emphasis on interactive systems and media.

Tech 2000 houses award-winning programs and new product introductions. The exhibits are accessible through self-guided tours (for walk-in visitors), guided tours (for focus groups from various user markets) and in-depth demonstrations of specific interactive programs. Staff members are available to answer questions and give more detailed explanations to visitors. (901 Eighth Street, NW, Washington, DC 20001; 202/682-2190.)

Smithsonian Institution

The National Demonstration Laboratory for Interactive Educational Technologies (NDL) has been established as a cooperative effort of the Smithsonian Institution and the Interactive Video Consortium (IVC), an organization of public broadcasting stations. The center, located within the Smithsonian's National Museum of Natural History, will be available to leaders in the fields of museology, education, publishing, and broadcasting, as well as legislators and public policy specialists.

According to Glen Hoptman, Director of the NDL, "The NDL is a technical assistance center to support individual efforts in the broad field of education. It is also a research and development center where we will look at issues and develop applications, explore the further reaches of interactive educational technologies and electronic publishing. We will also sponsor collaborative efforts among universities through the research consortium which we have established, and anticipate a quarterly publication called the *Journal of Hypermedia Studies*.

The Center is industry supported and is accepting donations of appropriate hardware systems and software programs to exhibit. The NDL opened on February 24, 1987. For more information or to schedule a visit, contact Glenn Hoptman, Director, National Demonstration Laboratory, Smithsonian Institution, Washington, D.C. 20560; 202/357-4748.

University of Calgary Nursing

As host of the 1985 International Symposium on Nursing Use of Computers and Information Science, the Faculty of Nursing in The University of Calgary recognized the need for promotion of Computer-Assisted Learning and Computer-Assisted Instruction in the nursing field. The lack of a dissemination centre for nursing computer courseware has prompted the Learning Resource Center (LRC) in the Faculty of Nursing and the Canadian Centre for Learning Systems (CCLS) to form a clearinghouse for computer software.

The aim of the Center is to provide exposure of computer courseware provided by software companies in the following areas: 1)Nursing clinical practice 2) Nursing education 3) Nursing research, and 4) Nursing administration or management. The LRC and CCLS currently have a variety of microcomputers and are requesting help in forming and updating this database centre. For additional information, contact the University of calgary, Faculty of Nursing (LRC), Room 415, Bio-Science Building, Calgary, Alberta T2N 1N4, CANADA.

UK National Demonstration Center

The National Interactive Video Centre (NIVC) was established in September 1984 in London in response to the widely expressed wish for an independent and neutral focal point of activity regarding interactive video. The intention of the Centre is to provide a base where trainers, educators, and others can explore the technology while they are still in the early stages of decision-making.

The Centre is a result of a collaborative venture, established under the auspices of the Council for Educational Technology for the UK, with financial support from the Department of Trade and Industry, the Manpower Services Commission, and two major companies involved in the manufacture of hardware, Philips and Thorn EMI. Services provided include: 1)collection of literature on interactive video, 2) collection of case studies in interactive video, 3)register of research, 4) workshops and seminars, 5) consultancy, 6) systems display area, and 7) monthly meeting of videodisc designers. For more information, contact the National Interactive Video Centre, 24-32 Stephenson Way, London NW1 2HD, England, UK; 01/387-2233.

Videodisc Mastering Companies

- **LaserVideo**, 1 East Wacker Drive, Chicago, IL 60601; 312/467-6755.
- **Pioneer Video, Inc.**, 600 E. Crescent Ave., Upper Saddle River, NJ 07458; 201/327-6400.
- **Sony Communications**, Sony Drive, Park Ridge, NJ 07656; 201/930-6177.
- **Technidisc**, 2250 Meijer Drive, Troy, MI 48084, 313/435-7430 or 800/321-9610.
- **3M Optical Recording Project**, 3M Center, Building 223-56, St. Paul, MN 55144; 612/733-2142.

Glossary

ANALOG INFORMATION: Data that has a steady flow from one value to another--a continuous range of value. Films and videotapes store analog information as opposed to digital information, which is stored on computer floppys. Analogy: An analog clock has minute and hour hands that have a sweeping movement--a continuous range of motion. A digital clock changes by the minute or second in discrete units.

ARCHIVAL: Of, in, or containing archives--records, documents, photographs, etc. Archival laserdiscs may store medical records, X-rays, medical databases, or any other information for later retrieval.

ARTIFICIAL INTELLIGENCE: A computer-driven program that, in effect, learns from its experience, therefore improving its performance over time. This type of adaptation is normally associated with human intelligence. An example would be a program to help physicians diagnose patients that becomes more sophisticated with each case--remembering and building on the "experience" it gained from all previous cases combined.

AUTHORING LANGUAGE: A code system uniquely suited for programming instruction--simplifies and short-cuts computer-programming with PROGRAMMING LANGUAGES. Although they use plain-English commands, authoring languages do not prompt the author and are usually cumbersome for non-programmers. AUTHORING SYSTEMS are better suited to the non-programmer.

AUTHORING SYSTEM: A code system for programming instruction, designed to be used by non-programmers. Authoring systems prompt authors to enter instructions in plain English and have underlying programs controlling actual computer programming.

BAR CODE: A block of parallel lines which are read by a scanner or wand and send codes to a computer. Now appear on almost all food packaging. Also used by the American Medical Association and the National Library of Medicine in textbooks and on other material to provide access to a laserdisc player.

BRANCHING: A common element of interactive videodisc instruction where the program jumps from one area of instruction to another. For example, when a learner selects from a multiple choice question on the screen, the program will "branch" to different areas of the lesson depending on the learners choice.

CAD: Computer-Aided Design.

CAI: Computer-Aided (or assisted) Instruction.

CAL: Computer-Aided Learning.

CAPACITANCE VIDEODISCS: Two incompatible systems that use a stylus or sensor to read recorded data. Electrical, not optical systems. Operate by storing an electrical charge which is picked up by the stylus. See also CED and VHD.

CAV: Constant Angular Velocity. A videodisc format where the disc rotates at a constant speed at all times (1800 rpm). Up to 30 minutes of motion video may be stored on

a 12-inch videodisc using this format. Also permits freeze-frame and slow motion options on playback. See also CLV.

CD: Compact Disc. 12-centimeter (4.75 inches) laserdisc that stores digitally-encoded information in CLV format. Well-known as the popular format for commercial music.

CD-I: Compact Disc-Interactive. Announced in March 1986, CD-I is to be fully compatible with CD and CD-ROM formats, while, at the same time, adding a few capabilities. CD-I video will be stored in digital form, and may be played back as full-frame stills or reduced motion (1/9 of screen size and only 6 frames/second). Audio will be stored in seven modes with four different quality levels. The CD-I will be marketed as a self-contained viewing unit and is expected to impact heavily on the education and entertainment markets.

CD-ROM: Compact Disc-Read Only Memory. Sometimes CD-ROM. A 12-centimeter laserdisc that stores digitally-encoded information in CLV format. Differs from CDs in the amount of error-correction information encoded. Used heavily for the storage of large medical databases--holds about 550 megabytes of data.

CD-V: Compact Disc-Video. Another compact disc format, announced in 1987, that holds five minutes of analog video and up to 20 minutes of conventional CD audio.

CED: Capacitance Electronic Disc. A grooved videodisc that requires a stylus ("needle") to read information. Not an optical system. Developed by RCA and marketed to the consumer/home market as SELECTAVISION. Discontinued by RCA in 1984.

CHAPTER STOP: Code which can be imbedded in a videodisc to signal the break between two separate chapters. Allows specific chapters to be accessed using the chapter search control of the videodisc player.

CHECK DISC: A videodisc used to confirm the placement and quality of recorded data. Usually inferior in quality to the final product.

CLV: Constant Linear Velocity. One of two formats for reflective optical videodiscs, CLV permits twice as much play time as CAV--up to one hour per side. CLV discs rotate at speeds that vary from 600 rpm to 1800 rpm, depending on the portion of the disc being read. CLV discs cannot provide freeze-frame or slow motion playback options.

COMPACT DISC: See CD.

COMPACT DISC-READ ONLY MEMORY: See CD-ROM.

COMPACT DISC-INTERACTIVE: See CD-I.

COMPACT DISC-VIDEO: See CD-V.

COMPACT VIDEO DISC: See CVD.

COMPOSITE VIDEO: The various elements needed to produce a color video single--used by television sets. Includes chromatic and luminance picture information, blanking pedestal, field, line, and color sync pulses, and field equalizing pulses. As opposed to RGB display--used in color computer monitors--comprised of red, green, and blue signals. See also RGB.

COMPRESSED AUDIO: See STILL-FRAME AUDIO.

CVD: Compact Video Disc. Introduced by Interactive Video Systems, the CVD is a 12 cm disc able to hold 20 minutes of analog video in CLV format, 12.5 minutes in CAV

mode, or 22,000 still frames. Will also be compatible with CD audio format. Not a product of Philips/Sony who develop all of the compact disc formats.

DIGITAL INFORMATION: Information expressed in binary form--on or off, ones or zeros. Computers work with digital information. As opposed to analog information.

DIGITAL OPTICAL DISC: Technically, all forms of optical disc that store digital information, such as the CD and CD-ROM, are considered digital optical discs. However, the 12- and 14-inch optical discs used to store records and documents in digital form are often referred to as digital optical discs to distinguish them from other formats..

DIGITAL VIDEO INTERACTIVE: See DVI.

DRAW: Direct-Read-After-Write. Optical disc technology that permits discs to be recorded in local environments such as hospital departments. DRAW discs may be recorded once and not erased. However, data may be recorded onto the disc in small increments over a period of time until the disc is full.

DVI: Digital Video Interactive: Announced March 1987, the DVI compresses digital video information to hold 72 minutes of full-motion, full-screen video. DVI was developed by General Electric/RCA.

EIDS: Electronic Information Delivery System. The hardware configuration selected by the Department of Defense for delivery of their interactive videodisc materials.

EMULATOR: A system designed to simulate interactive videodisc programs before mastering. Uses computer-controlled videotapes to simulate the final disc operation.

EXTERNAL COMPUTER: Any computer of any size which is connected to a disc player via some sort of cabeling device. As opposed to an ONBOARD MICROPROCESSOR with limited processing capability contained in Level II videodisc players.

FRAME: A single picture or image on a videodisc.

FRAME ADDRESS: See FRAME NUMBER.

FREEZE FRAME: A single from from a motion sequence that is held motionless on the screen. Should be distinguished from a STILL FRAME, which is a single frame meant to be shown without motion--such as a slide or photograph which has been transferred to videodisc.

GENERIC VIDEODISC: Videodisc which contains a collection of material--usually slides, short motion sequences, etc.--on a topic or topics. Generic discs are intended to provide material with which others may program their own instructional or reference material, and is not usually sold with accompanying computer programs or course of instruction. An early proponent of this approach was the University of Washington Health Sciences Learning Resources Center.

GRAPHIC OVERLAY: See OVERLAY.

INTERACTIVE: A computer or video application involving the participation and input of the user to determine the direction and flow of information. INTERACTIVE VIDEO involves a videodisc player or random-access videotape player--often under computer control. As opposed to LINEAR, which proceeds from beginning to end without user input or control.

INTERACTIVE VIDEO: See INTERACTIVE.

INTERFACE: The link between two pieces of equipment, ie. between a computer and videodisc player. The INTERFACE DEVICE provides communication between the two, allowing them to "talk" to each other.

ISD: Instructional Systems Design.

IVD: Interactive Videodisc

KEYPAD: A hand-held device--similar to a remote control used for television sets--which contains alphanumeric and other keys. Used to communicate with a computer or videodisc player.

KIOSK: A stand-alone display used to house a computer and/or videodisc player, monitor, and input devices (keypad, touchscreen, etc.). Usually located in public access areas and used to dispense advertising, promotional, or other information. Associated with POINT-OF-PURCHASE, and POINT-OF-SALE applications.

LASER: Light Amplification by Stimulation of Emission of Radiation. In laserdisc systems, a low-power laser is used to read microscopic pits which contain the coded material.

LASERCARD: A credit-card-sized plastic card with a metallic strip on which data can be stored and read using a laser source. LaserCard is a trademark of the Drexler Technology Corporation. A LaserCard holds up to 1 megabyte of information and is being used by a few companies to store medical histories and other medical records.

LASERDISC: Also Laser Disc. Common or generic name for REFLECTIVE OPTICAL VIDEODISCS. The word form "LaserDisc" (no space, capital D) is a trademark of Pioneer Electronics for its reflective optical videodisc products.

LASERFILM: Form of optical disc that consists of a photographic film base and is read with a laser that passes through the disc (TRANSMISSIVE). Trade name for McDonnell Douglas Electronics Company.

LASERVISION: The trade name for the reflective optical videodisc format used by Pioneer, Philips, Hitachi, and others. LaserVision videodiscs have become the industry standard.

LEVELS OF INTERACTIVITY: Three degrees of interactivity for videodisc systems. Proposed by the Nebraska Videodisc Design/Production Group in 1980.

Level I involves use of the videodisc player controls only--still/freeze frame, picture stop, chapter stop, frame address, and dual-channel audio features--with little or no processing.

Level II is controlled by a small microprocessor built into some videodisc players. Level II videodiscs have small "data dumps" in them that are loaded into the processor when the disc is played. Level II provides some programming features such as branching at multiple choice questions, continuous video loops, and the like.

Level III consists of the Level I or Level II players interfaced with an external computer. Level III, like level II, provides programed instruction. However, because the capabilities of the external computer are greater than the processors in Level II players, Level III programs can be far more sophisticated. Computers commonly used in Level III systems are IBM PC (and compatibles) and the Apple computers.

LIGHT PEN: A small, pen-like input device used to interact with videodisc or computer programs. The user touches the screen or monitor with the light pen.

LINEAR: Programs meant to be played from beginning to end without input or interruption. Most films and videotape programs are linear.

MASTER: Either 1) the original tape or film used to make copies or 2) the process of producing a "master" videodisc from which all other copies are replicated.

MENU: In a videodisc program, the menu provides a listing of options available to the user--much like a table of contents. Often there is a series of sub-menus as well.

NTSC: National Television Systems Committee that prepared the commercial standards for color broadcasting. NTSC standards are used in the United States, while PAL format is used in Europe, with the exception of France, which uses SECAM format. These formats are not compatible--PAL videodiscs will not play on NTSC standard players.

OMDR: Optical Memory Disc Recorder. A line of videodisc recorders made by Matsushita Panasonic. Many hospitals have installed the OMDRs to record the various medical imaging formats directly to disc.

ONBOARD MICROPROCESSOR: Small microprocessor built into Level II videodisc players. Programming code from the videodisc is "dumped" into the processor and permits a greater level of interactivity than players without the processor, but less than players connected to an EXTERNAL COMPUTER.

OPTICAL DIGITAL DATA DISC: Refers to any optical disc used to store digital information.

OPTICAL DISC: Technically, any disc format that uses a light source, usually a laser, to read and write information. See also Digital Optical Disc.

OPTICAL MEMORY: A generic term for technology that stores and reads information through the use of a light source, usually laser. Includes the terms optical disc, laserdisc, videodisc, CD, CD-ROM, CD-I, and LaserCard.

OROM: Optical Read-Only Memory. A 5.25-inch laser-encoded optical memory storage medium. The concentric circle format and constant angular velocity (CAV) of the OROM gives it a faster access time than CD-ROM discs, but less storage space (250 MB instead of 550 MB).

PAL: Phase Alternation Line. The European standard for color television, except in France. Not compatible with the U.S. standard, NTSC.

PICTURE STOP: The ability of some videodisc players to stop on a specific frame during play. Also the instruction encoded in the disc to cause it to stop on the predetermined frame.

POI: See Point-of-Information.

POINT-OF-INFORMATION: See Point-of-Purchase.

POINT-OF-PURCHASE: Interactive video systems (often housed in a kiosk) set up in public places to demonstrate products or encourage sales. Also Point-of-Information (POI) and Point-of-Sales (POS).

POINT-OF-SALE: See Point-of-Purchase.

POP: See Point-of-Purchase.

POS: See Point-of-Purchase.

PRE-MASTERING: The stage of producing a videodisc where the master videotape is checked and prepared for final transfer onto the master disc. Master videotapes are usually 1-inch Type C NTSC helical.

PROGRAMMING LANGUAGE: Multipurpose codes used by programmers to communicate instructions to a computer. Common programming languages include BASIC, COBOL, FORTRAN, Pascal, and C. To be distinguished from AUTHORING LANGUAGES like PILOT, which are code systems uniquely suited for creating instruction and AUTHORING SYSTEMS for instruction, which involve little coding and can be used by non-programmers.

RANDOM-ACCESS: A method of storing information so it can be accessed in any order. Unlike film, for example, which must be played all the way through to get from beginning to end, random-access videodisc players can "jump" from information stored at the beginning to information stored at the end in a few seconds.

REFLECTIVE VIDEODISCS: Contains information imbedded as pits or holes in surfaces which reflect laser light onto a mirror and into a decoder. As opposed to TRANSMISSIVE VIDEODISCS in which the laser light may pass through the disc.

RGB: Red-Green-Blue. A type of color output to computer display consisting of red, green, and blue signals. As opposed to COMPOSITE VIDEO used in television sets. RGB usually offers higher picture resolution than composite.

RS-232C: Standard serial interface between a computer and its peripherals, including some videodisc players.

SEARCH TIME: Time required by a computer or disc player to locate a specific frame or other piece of information.

SECAM: Sequential Couleur a Memoire. Color television format in France and Russia. Not compatible with the U.S. standard (NTSC) or the European standard (PAL).

SIMULATION: The realistic portrayal or representation of a situation or device--with varying degrees of realism. In medicine, computers and videodiscs are used to create patient simulations that provide physicians and nurses with the opportunity to practice diagnosing and treating various medical conditions. Medical equipment may also be simulated for operator training.

SPEECH RECOGNITION: See Voice Recognition.

SPEECH SYNTHESIZER: A device that produces human speech sounds from recorded input, usually stored in a computer.

STAND-ALONE SYSTEMS: Equipment that functions on its own-- such as Level II videodisc players--without being connected to a larger network (such as an external computer).

STEP FRAME: A function of optical videodisc players to "step" from one frame to another, forward or backward.

STILL-FRAME AUDIO: A method of storing several seconds of voice-quality audio in a single frame of a disc. The voice must be digitally encoded, stored on the disc, then dumped into a decoder for playback. MEDCOM tried this approach on a disc containing several hundred slide/tape programs using the EECO still-frame audio system.

TOUCH SCREEN: A video and/or computer screen which acts as an input device to a computer with the touch of a finger. The user is often asked to touch an area of the screen in response to a question. Different technologies are used in touch screens, including infrared grids, small wires separated by air spaces, changes in electronic capacitance, acceleration detection, and others.

TRANSMISSIVE OPTICAL VIDEODISC: A transparent videodisc that allows the laser to pass through the disc to the decoder. First system was developed by Thompson/CSF and is no longer manufactured. Only transmissive system on market today is the McDonnell Douglas Electronics Company (MDEC) LaserFilm system.

TURNKEY SYSTEM: An off-the-shelf hardware system that is ready to run on delivery—just "turn the key."

VHD: Video High Density. A format for videodisc that uses a gooveless capacitance videodisc and broad stylus to pick up data. Not an optical system. The format was developed by Matsushita/JVC and can play both NTSC and PAL format discs.

VIDEODISC: A generic term used to describe any discs of various formats (optical and capacitance) used to store video for playback. May also store audio and data signals.

VIDEODISC FORMATS: One of four types of videodiscs: Reflective Optical Videodisc, Transmissive Optical Videodisc, Capacitive Electronic Disc (CED), and Video High Density (VHD).

VIDEOTEX: Low-resolution text and graphics stored in a computer and displayed using special decoders.

VOICE RECOGNITION: Technology which allows computer and videodisc programs to be controlled by voice commands. The TIME Project at the Library of Medicine is pioneering this approach to videodisc-based patient simulations.

Appendix

ACCESS NETWORK
295 MIDPARK WAY S.E.
CALGARY, ALB T2G 4S6 CANADA
403/297-4952

ACTRONICS INC
810 RIVER AVENUE
PITTSBURGH, PA 15212
800/851-3780

ALEXANDER DESIGN
200 SOUTH DESPLAINES STREET
CHICAGO, IL 60606
312/648-9880

ALIVE CENTER
1248 WEATHERVANE LANE
AKRON, OH 44313
216/869-9623

ALLEN COMMUNICATIONS
140 LAKESIDE PLAZA/5225 WILEY POST
SALT LAKE CITY, UT 84116
801/537-7800

AMERICAN ACAD ORTHOPAEDIC SURGEONS
222 SOUTH PROSPECT AVENUE
PARK RIDGE, IL 60068
312/823-7186

AMERICAN COLLEGE OF RADIOLOGY INST
1891 PRESTON WHITE DRIVE
RESTON, VA 22091
703/648-8989

AMERICAN MEDICAL ASSOCIATION
532 NORTH DEARBORN STREET
CHICAGO, IL 60610

AMERICAN SOC CLINICAL PATHOLOGISTS
2100 WEST HARRISON STREET
CHICAGO, IL 60612
312/738-4857

APPLE COMPUTER
MARKETING DEPARTMENT
10201 TORRE AVENUE MS 47A
CUPERTINO, CA 95014

APPLE COMPUTERS MS36N
MGR MEDICAL MARKET
20525 MARIANA AVENUE
CUPERTINO, CA 95014

APPLIED INTERACTIVE TECHNOLOGY
621 LAKELAND EAST DRIVE
JACKSON, MS 39208
601/939-2987

APPLIED VIDEO TECHNOLOGY
5118 WESTMINSTER PLACE
ST LOUIS, MO 63108

ARGOSY NETWORK CORPORATION
120 30TH AVENUE NORTH
NASHVILLE, TN 37203
615/320-0777

ARIES SYSTEMS CORP.
ONE DUNDEE PARK
ANDOVER, MA 01810
617/457-7200

ARTEMIS
14 SHORT TRAIL
STANFORD, CT 06903
203/329-1815

AUBURN UNIVERSITY
COLLEGE OF VETERINARY MEDICINE
AUBURN, AL 36849
205/826-4425

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8500 NORMANDALE LAKE BLVD 9TH FL
MINNEAPOLIS, MN 55437

BAKER VIDEOACTIVE
4159 MAIN STREET
PHILADELPHIA, PA 19127
215/482-2900

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11001 NORTH FULTON AVENUE
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SCHOOL OF NURSING
FIRST & NORMAL
CHICO, CA 95929
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250 MAIN STREET EAST
HAMILTON, ONT L8N 1H6 CANADA
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SCHOOL OF MEDICINE
CLEVELAND, OH 44106

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11490 COMMERCE PARK DRIVE
RESTON, VA 22091
703/391-1900

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MONTREAL, QUE H2W 1R7 CANADA
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1501 WESTVIEW DRIVE
CORALVILLE, IA 52241
319/337-8109

COMPACT CAMBRIDGE
7200 WISCONSIN AVENUE
BETHESDA, MD 20814
301/951-6700

CONTACT INTERACT
60 OAK DRIVE
ORINDA, CA 94563
415/254-7958

CORNELL UNIVERSITY
PAYNE WHITING CLINIC/MEDIA CTR
525 EAST 68TH STREET
NEW YORK, NY 10021
212/746-3796

CORNELL UNIVERSITY MEDICAL COLLEGE
DEPARTMENT OF PATHOLOGY
1300 YORK AVENUE
NEW YORK, NY 10021
212/472-5150

COUNTY COLLEGE OF MORRIS
DEPARTMENT OF NURSING
RT. 10 & CENTER GROVE ROAD
RANDOLPH, NJ 07869
201/361-5000

CP EXPORT PTY. LTD.
P.O.S.S.U.M.
613 ST. KILDA ROAD
MELBOURNE 3004, VICTORIA AUSTRALIA
03/520 5333

DANIEL J. EDELMAN INC
1775 BORADWAY
NEW YORK, NY 10019
212/757-9100

DARTMOUTH MEDICAL SCHOOL
DEPT OF PATHOLOGY - MIS
BUTLER BLDG 1 ROOM 108
HANOVER, NH 03756
603/646-8044

DIALOG INFORMATION SERVICES INC.
3460 HILLVIEW AVENUE
PALO ALTO, CA 94304
415/858-2700

DIGITAL DIAGNOSTICS INC.
601 UNIVERSITY AVENUE #255
SACRAMENTO, CA 95825
916/921-6629

DIGITAL EQUIPMENT CORP.
12 CROSBY DRIVE
BEDFORD, MA 01730

DRAGON EXPERT SYSTEMS
235 PARK AVENUE SOUTH
NEW YORK, NY 10003
212/777-1330

EBSCO ELECTRONIC INFORMATION
P.O. BOX 13787
TORRANCE, CA 90503
213/530-7533

EDUDISC INC
1400 TYNE BLVD
NASHVILLE, TN 37215
615/373-2506

EFFECTIVE COMMUNICATION ARTS
221 WEST 57TH STREET
NEW YORK, NY 10019
212/333-5656

ELECTRONIC VISION
28 STATION STREET
ATHENS, OH 45701
614/592-2433

ELLIS ENTERPRISES INC.E
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FERRIS STATE COLLEGE
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BIG RAPIDS, MI 49307

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ATLANTA, GA 30328
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HEALTH EDUTECH
7801 EAST BUSH LAKE ROAD #350
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HOCKINGTON TECHNICAL COLLEGE
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HOUSTON ORTHOPAEDIC FOUNDATION
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1781 PRIOR AVENUE NORTH
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INFOTRONICS INC.
4060 FOURTH AVENUE SUITE 100
SAN DIEGO, CA 92103
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INSTITUTE FOR SCIENTIFIC INFORMATION
3501 MARKET STREET
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10675 SORRENTO VALLEY ROAD #200
SAN DIEGO, CA 92121
800/733-1010

INTELLIPATH
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